United States Court of Appeals
for the
District of Columbia Circuit

TRANSCRIPT OF RECORD

BRIEF FOR APPELLANT AND JOINT APPENDIX

United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA CIRCUIT

No. 19,243

CLARENCE I. JUSTHEIM,
Appellant,

v.

DAVID L. LADD,
Commissioner of Patents,
Appellee.

42

Appeal From the United States District Court
for the District of Columbia

United States Court of Appeals
for the District of Columbia Circuit

FILED MAY 28 1965

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STATEMENT OF QUESTIONS PRESENTED

I

Is it proper for the District Court to hold, in an action under 35 U.S.C. 145 against the Commissioner of Patents to compel issuance of a patent, that an invention has been insufficiently disclosed in the patent application when a witness skilled in the art concerned has given unquestioned testimony to the effect that the disclosure is sufficient to enable him to practice the claimed method on the basis of knowledge available at the time of the filing of such application?

II

Is it proper for the District Court to hold that an invention is unpatentable over the teachings of the prior art in the face of uncontroverted expert testimony as to surprising and unexpected results obtained from the invention, especially when a prior art patent cited as an anticipation mentions a theretofore common belief that high temperatures, such as are employed in the invention, are highly undesirable?

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United States Court of Appeals
FOR THE DISTRICT OF COLUMBIA CIRCUIT

No. 19,243

CLARENCE I. JUSTHEIM,
Appellant,

v.

DAVID L. LADD,
Commissioner of Patents,
Appellee.

Appeal From the United States District Court for the District of Columbia

BRIEF FOR APPELLANT

JURISDICTIONAL STATEMENT

This is an appeal from a decision of the United States District Court for the District of Columbia in an action against the Commissioner of Patents brought under the provisions of Title 35, Section 145, United States Code, requesting that appellant be adjudged entitled to receive a patent for an invention set forth in a patent application originally filed by him on September 28, 1955 (SJA, pp. 104-141).

The original application, Serial No. 537,123, was re-filed with additional subject matter on January 5, 1959 by plaintiff as continuation-in-part application Serial No. 785,552 (SJA, pp. 1-76), and was specifically abandoned in favor of such continuation-in-part.

On May 27, 1964 the Board of Appeals of the Patent Office affirmed the decision of the Principal Examiner refusing to grant a patent on the single claim ultimately asserted (SJA, pp. 73-76).

On December 16, 1964, the United States District Court for the District of Columbia upheld the decision of the Board of Appeals (JA, pp. 4-8).

This appeal from the decision of the District Court was filed February 10, 1965 (JA, p. 55).

STATEMENT OF THE CASE

On September 28, 1955, appellant filed with the United States Patent Office a patent application entitled "Distillation of Underground Deposits of Solid Carbonaceous Materials in Situ." This application, Serial Number 537,123 (SJA, pp. 104-141), was expressly abandoned on February 4, 1959 in favor of a continuation-in-part application, Serial No. 785,552, filed January 5, 1959 under the same title (SJA, pp. 1-79).

The invention is a process for the recovery of the organic content of oil shale, known as kerogen, by means of exceptionally high temperature heat applied to the oil shale in its natural location underground.

As specifically disclosed, the high temperature heat (at least 2000° F.) is produced by means of a nuclear reactor. It is applied to the oil shale in such a way as to effect distillation of the kerogen without fusing the shale rock.

The specification of appellant's original application describes two ways of taking the heat from a nuclear reactor and introducing it into the shale formation. One way involves the circulation of a high temperature liquid "for example, a molten metal such as liquid sodium" in a closed piping circuit "fabricated from a material capable of carrying and containing a heat-transfer medium at — at least 2000° Fahrenheit" (SJA, pp. 110, 111). The other way involves the passing of "inert gases, such as carbon dioxide, nitrogen or combustion products, in heat exchange relationship with the reactor and thence underground as a heating medium" (SJA, p. 116).

The Patent Office and the District Court have held that the disclosure is insufficient because appellant has failed to show that the heat-transfer liquid of a liquid-cooled nuclear reactor carries heat at a temperature of at least 2000° F. (JA, p. 7). However, appellant's witness, Morgan G. Huntington, testified during the trial in the District Court that prior to the filing of the original Justheim patent application there existed nuclear reactors operating with unclad fuel elements at temperatures up to 3,500° Fahrenheit and that these reactors used helium gas (an inert gas, see Webster's International Dictionary) as a coolant (JA, p. ~~48~~ 50).

Mr. Huntington also testified that, with his knowledge of nuclear reactors and oil shale recovery processes, he considered himself to be a person skilled in the art with which the patent applications in suit are concerned and that he believes the disclosure in the original Justheim application is "adequate" to enable him, as a person skilled in the art, to practice the invention as of the time the original application was filed (JA, p. ~~50~~ 35).

The claim on appeal is as follows:

> 23. A process of distilling oil shales in situ, comprising generating heat of at least 2000° F. by means of nuclear reaction; fissuring an extraction area within a bed of oil shale in its natural underground location by means of said heat and accompanying pressure; distilling the kerogen content of oil shale within said extraction area, by means of said heat; and extracting distillation products from said area.

In sustaining the Patent Office rejection of the appealed claim, the District Court relied upon the following patents:

Ljungstrom	2,732,195	January 24, 1956
French patent	1,147,517	June 11, 1957

The Ljungstrom patent (SJA, pp. 77-84) discloses a method of recovering oil from oil shale in situ, wherein an electric heater is placed in a bore hole to radiate heat to the shale. The heater produces temperatures between 500 and 1000° C., and the products distilled are recovered through other bore holes. This patent states that "high temperature has in the processes hitherto known an unfavourable influence on the oil products insofar as they are to a high extent carbonized and converted to non-condensable gases." (SJA, p. 82).

The French patent (SJA, pp. 85-87), which was first published more than two years after appellant's original application for patent was filed, describes a method of working deposits of coal, lignite, or other bituminous material by placing a charge of fissionable material directly in the deposit. The heat of fusion, producing temperatures up to 1200°, is sufficient to distill, carbonize, or coke the material.

This patent does not disclose any control structure for the charge of fissionable material, how the "packet" or "charge" of atomic energy is placed, how the heat generated thereby is transferred to the deposit, nor how the temperature is to be controlled to insure proper distillation and to avoid fusion. Moreover, the 1200° is not identified from the standpoint of the temperature scale intended. It is entirely possible that a person reading the disclosure would believe that the patent is concerned with a maximum temperature of 1200° Fahrenheit, not Centigrade. It was not until after the filing of appellant's continuation-in-part application (Nov. 18, 1959) that British patent No. 823,777 (SJA, pp. 88-90), corresponding to the French patent, disclosed a particular temperature scale.

During the trial in the District Court, appellant presented expert witnesses (JA, p. 15 et seq. and p. 22 et seq.), who testified that as a result of their examinations of shale samples and laboratory tests conducted using an electric furnace under conditions as nearly as possible approximating the in-situ conditions described in the patent application, they found that:

> at 1000° C., i.e., 1832° F., (Exhibits 7 and 8), there is no appreciable structural change in the shale rock (JA, pp. 17, 24) except that it becomes similar to an insulation material (JA, p. 25), although "the carbonation material goes off" (JA, p. 17);
>
> at 1093° C., i.e., 2000° F., (Exhibit 9), there is "a remarkable change, not just a slight difference in the breaking or cracking, but . . . extensive fissuring without any fusion . . . and a very open network susceptible for gases to pass through" (JA, p. 18);
>
> at 1120° C., i.e., 2048° F., (Exhibit 10), there is still considerable fissuring, but the shale is a little more rigid and a little more dense (JA, p. 19)
>
> at 1150° C., i.e., 2102° F., (Exhibit 11), the shale becomes fused, forming a solid slag mass (JA, p. 19); and
>
> the more the shale is fissured the faster and more efficiently the heat will be transferred through the bed of shale (JA, pp. 26, 27). Thus the heat will be best transferred if the shale is heated to a temperature whereat maximum fissuring is obtained, i.e., between 2000° F. and the fusion temperature.

STATUTES INVOLVED

35 USC 102. Conditions for Patentability; Novelty and Loss of Right to Patent

A person shall be entitled to a patent unless —

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent, or

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States.

35 USC 103. Conditions for Patentability; Non-Obvious Subject Matter

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

35 USC 112. Specification

The specification shall contain a written description of the invention and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor in carrying out his invention.

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

STATEMENT OF POINTS

I

The disclosure in original application Serial No. 537,123 is sufficient to enable any person skilled in the art concerned to practice the method claimed and it cannot be said that appellant did not set forth the best mode contemplated by him of carrying out the invention.

II

French patent No. 1,147,517 is not a valid reference in view of the sufficiency of the disclosure of appellant's original application for patent.

III

The subject matter appellant seeks to patent is so different from the prior art that, as a whole, it would not have been obvious at the time the invention was made to a person having ordinary skill in the art to which it pertains.

ARGUMENT

I

The Disclosure in Original Application Serial No. 537,123 Is Sufficient To Enable Any Person Skilled in the Art Concerned To Practice the Method Claimed and It Cannot Be Said That Appellant Did Not Set Forth the Best Mode Contemplated by Him of Carrying Out the Invention.

Neither the Patent Office nor the District Court gave full and proper consideration to the disclosure in the original application of the utilization of an inert gas as the coolant and heat-transfer medium. The testimony of Morgan G. Huntington is positive and credible in establishing the existence of knowledge under the control of the U. S. Atomic Energy Commission at the time appellant's original application was filed of a reactor cooled by an inert gas which could be used in connection with the Justheim invention (JA, p. 31). Thus, the contention that there is an insufficient disclosure because there was not in existence a liquid-cooled reactor capable of furnishing the required heat is inconsequential. If deemed necessary, appellant should be allowed to cancel from his specification all reference to a liquid-cooled reactor.

The appealed claim is for "a process of distilling oil shales in situ . . .," not for a nuclear reactor, and it should be clear that any known source of heat capable of producing the required quantity of heat will work as well in the process. A patent specification is not directed to the public generally, but to persons skilled in the art and it is not necessary to point out in the specification in detail those things which are familiar to them. See in this connection *Stauffer Chemical Co. v. Watson, Comm. Pats.* (D.C., Dist. Col.) 100 USPQ 209. 119 F. Supp. 312, and *Kollsman v. Ladd,* Comm. Pats. (D.C., Dist. Col.) 140 USPQ 309, 226 F. Supp. 186.

II

French Patent No. 1,147,517 Is Not a Valid Reference In View of the Sufficiency of the Disclosure of Appellant's Original Application for Patent.

The French patent was published November 26, 1957, long after the September 28, 1955, filing date of appellant's original application Serial Number 537,123. Since, as has been noted, the disclosure of the original application is sufficient to support the appealed claim in accordance with the provisions of 35 U.S.C. 112, the French patent cannot constitute a proper prior art reference to show that "the invention was . . . patented or described in a printed publication in this or a foreign country, before the invention thereof" by appellant, 35 U.S.C. 102(a) or that "the invention was . . . patented or described in a printed publication in this or a foreign country . . . , more than one year prior to the date of the application for patent in the United States," 35 U.S.C. 102(b).

III

The Subject Matter Appellant Seeks To Patent Is So Different From the Prior Art That, as a Whole, It Would Not Have Been Obvious at the Time the Invention Was Made to a Person Having Ordinary Skill in the Art to Which It Pertains.

This paraphrasing of 35 U.S.C. 103 sets forth concisely the reason why appellant's claimed invention is patentable and the holding of the District Court should be reversed.

It has been shown above that the French patent is not a valid reference. If this is accepted, the only prior art is the Ljungstrom patent. The method disclosed by it differs from the claimed method in the use of an electric heater to supply heat within a relatively low temperature range whose upper limit is set at 1000° C. (1832° F.).

Ljungstrom also discloses that to use temperatures far in excess of those required for distillation of the organic content will result in "an unfavorable influence on the oil products insofar as they are to a high extent carbonized and converted to non-condensable gases." (SJA, p. 82, col. 1, lines 29-33). He presumably advances the art in teaching that a source temperature of up to 1000° C. is not harmful if it is rapidly dissipated to the shale, but he does not suggest that temperatures above 1000° C. can be used, even with his particular technique of rapid dissipation.

Appellant also recognized the undesirability of a heat build-up at the source, but discloses in his applications and proved by expert testimony at the trial that if a proper amount of high temperature heat is applied to the shale, there is no dangerous heat build-up because the shale fissures extensively and results in rapid and efficient dissemination of the heat away from the heat source. Appellant has thus avoided the necessity of providing a special heat-dissipating means, such as is required by Ljungstrom, in each bore hole through which heat is applied. At the same time, he recovers kerogen from a maximum area of the underground shale formation, because of his unusually high temperature source of heat.

If it had been obvious to increase the temperature from the 1832°F. of Ljungstrom to appellant's 2000°F., by what the District Court regarded as a mere 168° F., Ljungstrom would have been the first to recognize the advantages. But he did not. Instead, he cautioned against the use of high temperatures unless his process and apparatus were employed, and even with his process specified a top limit significantly below appellant's lowest.

The Ljungstrom patent does not teach appellant's process, nor would appellant's process be obvious to one practicing the Ljungstrom method. This is borne out by the testimony of appellant's expert, Dr. John F. Schairer, who, when asked to characterize the difference of fissuring occurring at 1000° C. in the shale of Exhibits 7 and 8 (the maximum temperature of the Ljungstrom patent) and that occurring in the shale of Exhibit 9 (the 2000° F. minimum temperature called for by the claim on appeal) stated:

> "Very minor at a thousand and very, very pronounced and very, very lovely structure at 2000° Fahrenheit, which is remarkable. You wouldn't expect it." (JA, p. 21).

Contrary to the expressed opinion of the District Court (JA, p. 7). counsel for the Patent Office did not elicit from Dr. Schairer that "it might be expected that as the temperature to which the shale is subjected is increased, the increased fissuring effect observed by plaintiff would follow." (See cross-examination of Dr. Schairer, JA, pp. 20-22.)

While it is true that appellant's expert, Dr. Donald T. Bonney, stated on cross-examination that if the temperature of shale was raised above the maximum temperature of the Ljungstrom patent "you would expect to get increased fissuring" (JA, p. 26), he did not say that "the increased fissuring observed by plaintiff would follow" as indicated by the District Court (JA, p. 7). Instead, Dr. Bonney stated, in effect, that although some increased fissuring would be anticipated, he normally would not have expected the greatly increased fissuring occurring as a result of a temperature increase from 1000° C. (1832° F.) to 2000° F., and that it was only after seeing samples of shale heated to these temperatures, and observing the greatly increased fissuring, that he was able to postulate a reason for the extensive fissuring at the somewhat higher temperature (JA, p. 27).

It is submitted that the use of a temperature at least 2000° F. as the heat source is not in any way made obvious by the Ljungstrom patent.

Even though it be determined that the French patent is a proper reference, it does not fully meet appellant's claim, nor does it make the invention obvious to one skilled in the art, taken singly or with the Ljungstrom patent.

The French patent does not disclose sufficient apparatus to perform the process claimed by appellant, and it does not teach the process itself. This patent teaches using atomic fission as a source of heat, but the temperature disclosed by the French patent, even if it be regarded as Centigrade (1200°, i.e., 2192 F.), is completely unusable in appellant's process because it is too high, being well above the fusion point of the shale as shown by Exhibit 11 (2102° F.). Moreover, no structure is disclosed that will allow the heat to be controlled in accordance with the characteristics of the shale material (see appellant's thermostat 23, SJA, p. 122). If a temperature of 1200° C. were actually applied to the oil shale, the shale rock would slag and the desired rapid heat transfer and extensive fissuring could not occur. Obviously, this would be completely unsatisfactory.

It is quite apparent that the only teaching of appellant's invention comes from appellant himself. The Patent Office and the District Court have applied hindsight in holding the invention to be unpatentable over the Ljungstrom and French patents, whether these patents be taken singly or in combination.

Respectfully submitted,

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      Direct 15
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      Direct 22
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    Morgan G. Huntington
      Direct 27
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DOCKET ENTRIES

1963	
July 26	Complaint, appearance; ser. 7-30-63, filed.
July 26	Summons, copies (3) and copies (3) of Complaint issued ser. 7-29; AG ser. 7-29; US Atty
Sept. 19	Answer of deft. to complaint; appearance of C.W. Moore; c/m 9-18-63. filed.
Sept. 19	Calendared. (AC/N) (N)
1964	
May 21	Appearance of Philip A. Mallinckrodt (10 Exchange Place, Salt Lake City, Utah) as co-counsel for plaintiff. filed.
May 21	Heard; taken under advisement; counsel to submit briefs, proposed findings of fact, and conclusions of law. (Rep: Jack Maher) Jackson, J.
Dec. 16	Transcript of proceedings, 5/21/64, pages 1-82, inclusive. (Rep: Jack Maher. Court's Copy) filed
Dec. 16	Pretrial brief of plaintiff. filed
Dec. 16	Post trial brief of plaintiff. filed
Dec. 16	Post trial brief of defendant. filed
Dec. 16	Memorandum opinion, findings of fact and conclusions of law finding in favor of defendant against plaintiff and dismissing complaint. (N) Jackson, J.
Dec. 16	Judgment in favor of defendant vs. plaintiff and dismissing complaint; costs against plaintiff. (N) Jackson, J.
1965	
Feb. 10	Notice of appeal of plaintiff; exhibit; deposit by Arkwright $5.00. (copy mailed to C.W. Moore; notice to Philip A. Mallinckrodt) filed

March 1	Statement of points by plaintiff.	filed
March 1	Partial transcript of proceedings 5/21/64; pages 1 and 4-79. (Rep. J. Maher) (Attorney's copy)	filed

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IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA

CLARENCE I. JUSTHEIM)
748 Hilltop Rd.)
Salt Lake City, Utah)
Plaintiff)
v.) Civil Action No. 1911-63
DAVID L. LADD,) [Filed July 26, 1963]
Commissioner of Patents,)
Defendant)

COMPLAINT

(ISSUANCE OF PATENT)

Plaintiff alleges:

1. This action is brought pursuant to the provisions of Title 35, United States Code, Section 145.

2. On September 28, 1955 plaintiff filed with the United States Patent Office an application for patent entitled "Distillation of Underground Deposits of Solid Carbonaceous Materials in Situ" which was assigned Serial Number 537,123 and on which proceedings were duly had.

3. Prior to any final determination of the merits of the aforesaid application Serial Number 537,123 and on January 5, 1959 plaintiff filed, as a continuation-in-part of said application Serial Number 537,123, a similarly entitled application for patent which was assigned Serial Number 785,552 and on which proceedings were duly had to the stage of appeal to and decision by the Board of Appeals on Claim 23, the only claim remaining in the application.

4. The said Claim 23 in application Serial Number 785,552 was rejected by the Board of Appeals of the United States Patent Office in its decision dated the 27th day of May, 1963.

5. Plaintiff is the original and sole inventor of the new and useful method described in the aforesaid applications for patent Serial Numbers 537,123 and 785,552 and particularly pointed out and distinctly claimed in the said Claim 23 of application Serial Number 785,552; said claim was improperly refused plaintiff by said Board of Appeals.

WHEREFORE, plaintiff prays that he be adjudged entitled to receive a patent for his said invention as specified in the said Claim 23 and that the defendant be ordered to grant a patent on plaintiff's said application Serial Number 785,552.

SHLESINGER, SHLESINGER &
ARKWRIGHT
By /s/ George Arkwright, Jr.
Attorneys for Plaintiff

Of Counsel:
Philip A. Mallinckrodt
B. Deon Criddle

[Filed September 19, 1963]

ANSWER TO COMPLAINT

To the Honorable the Judges of the United States District Court
for the District of Columbia

1, 2, 3, 4. The defendant admits the allegations of paragraphs 1, 2, 3, and 4 of the complaint.

5. The defendant denies the allegations of paragraph 5 of the complaint.

FURTHERING ANSWERING, the defendant asserts that the plaintiff is not entitled to a patent containing claim 23 of his application, Serial Number 785,552, involved in this civil action, for the reasons given and in view of the references cited in the Examiner's answer and in the decision of the Board of Appeals in that application. Profert hereby is made of copies of the answer, decision and references.

Respectfully submitted,

/s/ C.W. Moore
Solicitor, U.S. Patent Office
Attorney for Defendant

[Filed Dec. 16, 1964]

ORDER

This cause came on for trial on May 21, 1964. Upon consideration of the record herein, as well as the briefs which the Court accorded counsel for plaintiff and defendant an opportunity to file, it is this 16th day of December, 1964,

ORDERED, that judgment be, and the same is hereby entered in favor of defendant, and that the Complaint be, and is hereby dismissed, with costs to be assessed against plaintiff.

/s/ JOSEPH R. JACKSON
United States District Judge

[Filed Dec. 16, 1964]

OPINION

This civil action was brought pursuant to 35 U.S.C. 145 seeking judgment authorizing the defendant, Commissioner of Patents, to grant Letters Patent of the United States containing claim 23 of plaintiff's patent application Serial No. 785,552, filed January 5, 1959, entitled "Distillation of Underground Deposits of Solid Carbonaceous Materials in Situ". The application is a continuation-in-part of plaintiff's prior application Serial No. 537,123, filed September 28, 1955, entitled identically.

The invention relates to a method for recovering the kerogen content of oil shale by applying to the shale, in situ, heat at a temperature of at least 2000° F. The high temperature is obtained by the use of a nuclear reactor. Two arrangements are described for applying the heat of the reactor to the shale. In the first, the nuclear reactor is positioned adjacent the deposit, and the high temperature produced in the reactor is transferred to a medium which is circulated directly through heat exchangers positioned in a bore in the deposit. In the second, the reactor itself is located in a bore hole sunk in the deposit, and by appropriate arrangement of fuel, moderators, and hollow control rods, temperatures up to about 6000°F. are said to be attained.

The disclosure of plaintiff's first application, filed in 1955, was the same as the disclosure of the application at suit, except for the feature of embedding the reactor itself in the deposit.

Only one claim is at issue, and it reads as follows:

Claim 23:

> A process of distilling oil shales in situ, comprising generating heat of at least 2000°F. by means of nuclear reaction; fissuring an extraction area within a bed of oil shale in its natural underground location by means of said heat and accompanying pressure; distilling the kerogen content of oil shale within said extraction area, by means of said heat; and extracting distillation products from said area.

The claim was rejected in the Patent Office on three grounds: first, as based upon an insufficient disclosure; second, as unpatentable over a United States Patent to Ljungstrom, and third, as unpatentable over a French patent (No. 1,147,517) of June 11, 1957. The defendant relied upon these same grounds for rejection at trial.

The Ljungstrom patent, No. 2,732,195, granted January 24, 1956, describes a method of recovering oil from shale in which an electric heater transmits heat to the shale through channels bored into the deposit. The heater produces temperatures between 500 and 1000°C., and the products distilled are recovered through other channels spaced from the channels carrying the heaters.

The French patent, No. 1,147,517, of June 11, 1957, describes a method of working deposits of coal, lignite, or other bituminous materials, by placing a charge of atomic fissionable material directly in the deposit. The heat of fission, producing temperatures up to 1200°C., is sufficient to distill, carbonize, or coke the material.

The first ground of rejection is based upon the language of 35 U.S.C. 112, which requires that the "specification shall contain a written description of the invention, and of the manner and process of making and using it in such full, clear, concise, and exact terms as to enable any person skilled in the art . . . to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out the invention." In order to gain the benefit of the 1955 filing date under 35 U.S.C. 120, the plaintiff must meet this requirement of Section 112. In his 1955 disclosure, plaintiff described the reactor only by means of a rectangular box shown in his drawing. The Patent Office held this to be insufficient. At trial, plaintiff pointed to two United States patents to show that in 1955 nuclear reactors were known which would have provided the heat required for plaintiff's purpose. The patents cited were to Thomson et al., No. 2,992,981, and Wollan, No. 2,990,348. The Thomson et al. application, filed October 29, 1953, and patented July 18, 1961, disclosed in detail a nuclear reactor described as operating at a temperature of 2500°F. The Wollan application, filed May 26, 1950, and issued June 27, 1961, disclosed, according to plaintiff, a method and operation for producing power wherein a peak temperature of 2000°F. was employed.

The Patent Office responded by showing that the coolant used in the Thomson et al. patent operated at a much lower temperature than

2000°F. even though the temperature of the nuclear *fuel* was 2500°F. It also demonstrated that the Wollan coolant, by its nature, was incapable of having temperatures of 2000°F.

From this evidence, the Court cannot say plaintiff showed the Patent Office to be clearly wrong in its finding that the disclosure in 1955 failed to comply with the requirements of 35 U.S.C. 120.

Since the plaintiff is not entitled to the benefit of the 1955 filing date, both the French patent and the Ljungstrom patent became available as references for the purpose of determining whether or not the plaintiff's invention would have been obvious to one skilled in the art at the time it was made.

As previously noted, the Ljungstrom patent discloses heating oil shale *in situ* with temperatures up to 1832 F. The essential difference between this temperature and the plaintiff's claim, therefore, is a matter of 168°F.

The plaintiff presented at trial two expert witnesses, both of whom testified that a "remarkable difference" was observed between the results obtained from using the lower temperature (1832°F.) and from using plaintiff's temperature of 2000°F. The Patent Office, upon cross-examination, elicited from these experts an admission that it might be expected that as the temperature to which the shale is subjected is increased, the increased fissuring effect observed by plaintiff would follow.

The French patent discloses heating oil-bearing material to 1200°C. (2192°F.) to distill out the oil, and suggests the use of a nuclear reactor to produce the necessary temperature. Hence, the broad concept of heating oil-bearing materials at a temperature above 2000°F. was known to the art at the time plaintiff made his contribution.

In view of the closeness of the subject matter known in the prior art to that claimed by the plaintiff, and in the absence of any evidence conclusively showing this difference to be unobvious, the Court cannot say that the Patent Office was clearly wrong in rejecting the claim. Accordingly, the Court finds for the defendant and against the plaintiff, and will dismiss the Complaint.

The above Opinion contains Findings of Fact and Conclusions of Law.

DATED: December 16, 1964.

JOSEPH R. JACKSON
United States District Judge

[Filed March 1, 1965]

Washington, D.C.
Thursday, May 21, 1964.

The above-entitled matter came on for trial at 10:00 a.m. before the HONORABLE JOSEPH R. JACKSON, Judge, United States District Court.

Appearances:

On behalf of the plaintiff:

PHILIP A. MALLINCKRODT, ESQ.
10 Exchange Place
Salt Lake City, Utah.

GEORGE A. ARKWRIGHT, ESQ.
Shlesinger, Shlesinger & Arkwright
943 Munsey Building
Washington, D.C.

On behalf of the defendant:

JOSEPH SCHIMMEL, ESQ.
Solicitor's Office
U.S. Patent Office.

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PROCEEDINGS

THE COURT: Read the case, Mr. Clerk.

THE DEPUTY CLERK: Civil Action Number 1911-63, Clarence I. Justheim versus David L. Ladd, Commissioner of Patents.

THE COURT: Are the parties ready?

MR. ARKWRIGHT: Ready, Your Honor.

MR. SCHIMMEL: Ready, Your Honor.

MR. ARKWRIGHT: May it please the Court, I would like to introduce my co-counsel, Mr. Philip A. Mallinckrodt of Salt Lake City, Utah. He is a member of the highest courts of the States of New York and Utah.

THE COURT: Is he going to conduct the trial?

MR. ARKWRIGHT: Yes, your Honor.

THE COURT: Well, the motion is granted pro hac vice.

I am glad to welcome you from my sister state, Montana.

Well, Mr. Mallinckrodt, let me hear what you have to say concerning the alleged defects in the decision of the Board.

OPENING STATEMENT ON BEHALF OF THE PLAINTIFF

MR. MALLINCKRODT: May it please the Court. Your Honor, this is the usual case under 35 U.S. Code Section 145 against the Commissioner of Patents requesting this Court to authorize the Commissioner to grant a patent on an application of Clarence I. Justheim.

5 Mr. Justheim, the plaintiff, filed an application for patent in September, 1955. That was prosecuted through the Office to a point where it became desirable to file a continuation-in-part application. That was filed in 1957. The claim on appeal comes from the second application. It has its roots in the first application, and one of the issues in this case is whether there is an adequate disclosure as of September, 1955, to support the claim that is being made.

The second issue in this case is the patentability of the claim over references cited by the Patent Office, the primary reference being a Swedish patent to Ljungstrom. There is a U.S. patent and a Swedish patent. I understand that the Patent Office is not pressing the Swedish patent because it is essentially the same as the U.S. patent.

The plaintiff will show that there is an adequate disclosure in the 1955 application for patent. We are not unmindful of Your Honor's recent decision in Levy versus Ladd which deals with a somewhat similar question, where expert testimony was advanced to support a showing in the application which was a labelled box in the drawing indicatin that instance a computer. In our case we have a box labelled nuclear reactor.

It is the Patent Office's position that at the time of filing our application
6 in 1955 there was no nuclear reactor capable of sustained operation at the temperature which applicant is asserting in his application, and which is set forth in the claim.

It is our position that there was such a nuclear reactor, that not only was it possible to produce one by those skilled in the art, but that designs were actually in being that were detailed and that were sufficient to produce the temperature that the Patent Office has questioned.

Those are the two issues in the case, Your Honor, and we propose to put on our proofs from that standpoint.

THE COURT: Very well.

You might as well introduce your exhibit number 1, the certified copy of the Patent Office file.

MR. MALLINCKRODT: Yes, Your Honor. We have both applications and I offer them both as exhibits number 1 and 2.

THE COURT: They both may be received into evidence.

And you, Mr. Schimmel, might offer your exhibit number 1 out of order.

You know what it is, do you, Mr. Mallinckrodt?

MR. MALLINCKRODT: Yes. I have no objection, Your Honor.

MR. SCHIMMEL: In our exhibit, Your Honor, there is a French patent which has been referred to as a basis of rejection. I am in-

7 cluding a British patent which is a duplicate of the French patent as a translation. Mr. Mallinckrodt has no objection to that, so that will be included in our exhibit as a translation of the French patent to be relied on here.

THE COURT: Very well, it may be received. Mark it as such.

THE DEPUTY CLERK: Plaintiff's Exhibits 1 and 2 and defendant's exhibit 1 are marked in evidence.

(Plaintiff's Exhibit Nos. 1 and 2 and Defendant's Exhibit No. 1 were received in evidence.)

OPENING STATEMENT ON BEHALF OF THE DEFENDANT.

MR. SCHIMMEL: Your Honor, May I have a minute to clarify the issue here, because I am not sure Mr. Mallinckrodt has expressly pointed out what the issue is?

THE COURT: Very well.

MR. Schimmel: Actually the application involved in this proceeding, the continuation-in-part application, is and was rejected by the Examiner and the Board as failing to comply with the statutory mandates of 112, that there be a complete, full and clear description of the invention, and that the inventor describe in his application the best mode in which he has found for carrying out his invention. Now that applies to the application involved in this proceeding.

8 THE COURT: Suppose there is only one mode, what then, does it have to be designated?

MR. SCHIMMEL: Designated in the application. That is a primary issue, as I see it, with respect to the application involved here.

Now in making this contention I am not unaware of the fact -- and I believe it can be conceded for the purposes of this trial -- that the Examiner and the Board have considered that included in the disclosure here is the subject matter of a pending application referred to of a different inventor as a suitable nuclear device that could be used to carry out the process. But I think the record will show that the Examiner has, in his consideration of the subject matter, re-

ferred to that application of Mr. Huntington -- which is in this specification as a suitable nuclear device -- but he says that disclosure is insufficient also for the purposes for which the claimed method is limited; the purpose to which it is limited. The Examiner and the Board considered that the primary improvement or novel element here is the attainment of a temperature of at least 2,000 degrees Farenheit in a shale deposit, and by virtue of that temperature of at least 2,000 Farenheit there is distillation of the oil shale and subsequent recovery. Now the whole novelty and the predication of
9 patentability is on the use of a nuclear device which will permit the attainment of that temperature.

Now it is our position, and it was the position of the Board and the Examiner, that even the Huntington application referred to, if it were incorporated completely, its disclosure incorporated completely, in Mr. Justheim's application involved here, we would still not have a full and complete disclosure as required by the statute.

I am not sure that Mr. Mallinckrodt pointed that out to Your Honor, but I want to emphasize that. We are conceding that you could incorporate into the Justheim disclosure the Huntington disclosure and yet you would still be inadequate for the purposes of this case.

THE COURT: In what respect inadequate?

MR. SCHIMMEL: Because the Huntington application also, we say, does not disclose how you can attain a temperature of at least 2,000 degrees Farenheit at the point that you want it if you are using a nuclear reactor and a circulating coolant in the reactor and heat exchange system. There is no disclosure in the Huntington case that that heat exchange system or the super-heated steam that might be produced by the heat exchange system is at a temperature of 2,000 degrees Farenheit. The maximum that I could find in it was about 1,000 degrees Farenheit. At least 2,000 is the critical limitation in the claim before the Court. So insofar as there is disclosed in the
10 Justheim case the use of a heat exchange system to take the heat de-

veloped in the nuclear device and submit that to the underground deposit, we say that the Huntington application doesn't disclose that.

Secondly, we say that in the second form disclosed in the Justheim case which is before the Court, in which the nuclear reactor itself is presumably imbedded in the drill hole, and the controls presumably are adjusted so as to obtain the desired temperature, there was no known device at the time Mr. Justheim filed his application which would permit that operation.

So that whether you consider the one form of the device, where there is a heat exchange through the nuclear reactor, or whether you imbed the nuclear reactor in the drill hole in the oil shale, there is no disclosure of a device, suitable device, to accomplish that result or purpose.

The second rejection involves another question of law, because intermediate the filing of Justheim's first application in 1955 and the presently involved case in 1959 the French patent issued with effective date of 1957.

The French patent discloses that you could use broadly the concept of using a nuclear reactor to generate heat in the oil shale and distill from the shale the volatile products, the organic material in the
11 shale.

Now the contention here is that Justheim antedates the French patent because of the first Justheim case. Now that first Justheim case was rejected by the Office on the ground of insufficient disclosure. It only has disclosed in it the first form of device, where there is a heat exchange system for taking off heat from the nuclear reactor and permitting that super-heated steam or whatever it may be to penetrate the bore. As I say, there was no suitable reactor which was known at that particular time in 1955 that would accomplish that purpose.

The case was rejected for insufficient disclosure, finally rejected for insufficient disclosure, and it was abandoned by Mr. Justheim in favor of the present case.

Now under the adjudications of the Court of Customs and Patent Appeals, we say they are not entitled under section 120 to the benefit of the filing date of the 1955 case because of the specific limitation in section 120 of the statute, that the prior application must be one which satisfies the requirements of section 112.

So that issue of law is involved in connection with the second ground of rejection in this case. That is essentially the issues, as we see them, before the Court this morning.

THE COURT: Call your first witness. How many witnesses are
12 you going to have?

MR. MALLINCKRODT: Your Honor, I have three witnesses in Court at the present time. We may have a fourth witness, depending upon whether he is available or not.

THE COURT: Well the Court will take its usual recess at 12:00 o'clock this afternoon -- it usually takes it at 12:30 -- and the afternoon session will start at 2:00 or 2:15. I have an engagement which makes this necessary.

MR. MALLINCKRODT: Your Honor, before I call the witness, I would like to offer in evidence three patents.

The first one is one to W. B. Thomson Et Al., Number 2,992,981, granted in 1961. It was assigned to the United States of America as represented by the United States Atomic Energy Commission.

The Second one is to E. O. Wollan, Number 2,990,348, granted in 1961, the party in interest also being the Atomic Energy Commission.

THE COURT: Do you have copies of those?

MR. SCHIMMEL: Yes, I have.

THE COURT: Do you have any objection?

MR. SHCIMMEL: No objection.

THE COURT: They may be marked in evidence.

THE DEPUTY CLERK: Plaintiff's Exhibits 3 and 4 are marked in evidence.

(Plaintiff's Exhibits Nos. 3 and 4 were received in evidence)

13 MR. MALLINCKRODT: I have one more exhibit apropos opposing counsel's opening statement, a Canadian patent granted to Morgan G. Huntington entitled "Radiant Nuclear Boiler" issued in 1963.

THE COURT: Do you have a copy of that?

MR. SCHIMMEL: No, sir.

THE COURT: Show it to counsel.

Are you familiar with it?

MR. SCHIMMEL: I have no objection.

THE COURT: Very well, it may be marked in evidence.

THE DEPUTY CLERK: Plaintiff's Exhibit Number 5 is marked in evidence.

(Plaintiff's Exhibit No. 5 was received in evidence.)

MR. MALLINCKRODT: Dr. Schairer, will you please step forward.

Thereupon --

DR. JOHN F. SCHAIRER

was called as a witness by and on behalf of the plaintiff and, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. MALLINCKRODT:

Q. Will you please state your full name?

14 A. John Frank Schairer.

Q. Where do you reside? A. 3604 Thornapple Street, Chevy Chase, Maryland.

Q. What is your occupation? A. My title at the laboratory is physical chemist.

Q. And what laboratory are you associated with? A. Geophysical Laboratory, Carnegie Institution of Washington.

Q. Can you give us some details as to your duties at the laboratory? A. I am interested in pure research in the application of physical chemistry to geological problems, the origin of volcanoes, the origin of igneous rocks and the behavior of rock materials within the surface of the earth.

Q. Does this involve high temperatures? A. It sure does.

Q. In the order of 2,000 degrees Farenheit, for example? A. That is a low temperature compared to some I have to go to.

Q. What is your educational background? A. I went to Yale and got a B.S. in Chemistry, an M.S. in Geology and a Doctor of Philosophy in Physical Chemistry.

Q. And how long have you worked for the Carnegie Institution?
15 A. Since September 1st, 1927.

Q. Has your work since that time been in the field that you have indicated? A. It has.

Q. Now have you made high-temperature tests on oil shale especially for this court case? A. Yes, I have.

Q. And where did you get the shale? A. It was sent to me by airfreight from the Laramie Research Center of the U.S. Bureau of Mines, Box 3395 University Station, Laramie, Wyoming.

THE DEPUTY CLERK: Plaintiff's Exhibits 6 through 11 are marked for identification.

(Plaintiff's Exhibits Nos. 6, 7, 8, 9, 10 and 11 were marked for identification.)

BY MR. MALLINCKRODT:

Q. Dr. Schairer, I hand you what is marked for identification plaintiff's exhibit 6, and I ask you to identify that? A. That is a sample of the oil shale just as I received it from the Bureau of Mines in Laramie. This is the material I used for the tests.

Q. That has not been subjected to heat treatment? A. Nothing has happened to it at all. It just came through the air freight in a little card-
16 board box.

Q. I hand you what has been marked plaintiff's exhibit 7 for identification and ask you to identify that? A. Well, that is a piece of it. What I did was to take a hammer -- it came in big chunks -- and hit off some reasonable number of portions and put them in a platinum crucible and put them in a furnace at 1,000 degrees Centigrade -- the type of furnace

I use for all my experiments -- and left in the crucible for two hours and then took it out and here it is.

Q. Will you describe the physical characteristics of this material? A. Well, you can see that this black shale, as soon as you heat it up the carbonation material goes off in a hurry and some change takes place in the original rock.

You have a change in the chemistry and there is some change in the structure. There is some shrinking of the thing, but at 1,000 degrees Farenheit there hasn't been any appreciable change; some minor fissuring and that is all.

Q. Now you indicated that was held in the crucible for how long? A. Two hours.

Q. I hand you what has been identified as plaintiff's exhibit 8 for identification and ask you to identify that? A. Well, that is a specimen heated at the same temperature but for a longer period of time.
17 I left it in overnight, in other words, 18 hours at this same temperature, 1,000 degrees Centigrade. It is very similar to the other one except it is a little more pliable, it falls apart a little easier. In other words, it establishes nearly everything that is going to happen happens within an hour or two. You don't have to leave it in for a long, long time.

Q. Then you would say that the two specimens are appreciably the same? A. Essentially the same.

Q. Even though the time was different? A. That is why we varied the time, so we can be sure of that fact.

Q. Dr. Schairer, would you describe in a little more detail the environment that those specimens were in during this heat treatment? A. Well, essentially you have a furnace tube surrounded by a heating element. And you put electric current through it and it gets hot. You have some insulating material because you want to heat the specimen and not the whole room. So you have in that furnace a pedestal on which you set the crucible and you set the pedestal in the hot zone of the fur-

nace. And what you do is put a thermocouple in to read the tempera-
ture. And when it has settled down and you are sure the temperature
18 isn't going to change then you put in the crucible and read the temper-
ature again afterwards to be sure that it has not changed. And then you
dump the stuff out of the crucible merely so you can use the crucible
for another experiment. And all we have done is just put them in these
bags just as they came from the crucible.

Q. Dr. Schairer, are you familiar with the Ljungstrom patent cited by the Examiner in this case? A. Yes, I am.

Q. Would you say that these specimens, exhibits 7 and 8, are typical of what would result from the use of the top temperature, 1,000 degrees Centigrade, specified in the Ljungstrom patent? A. I would say yes, because especially on the bases we have tried them at a lot of other temperatures and we know this is about what you would expect.

Q. Now, Dr. Schairer, I hand you what has been marked for ident-
ification as plaintiff's exhibit 9 and ask you to tell us about that speci-
men? A. This is a specimen which was held for two hours at 1093
degrees Centigrade or 2,000 degrees Farenheit. The 2,000 degrees
Farenheit is the one in the Justheim patent disclosure. And if anybody
examines these he will notice there has been a remarkable change, not
just a slight difference in breaking or cracking, but you have got ex-
19 tensive fissuring without any fusion, but extensive fissuring and a very
open network susceptible for gases to pass through it, etc. There has
been a remarkable change between 1832 Farenheit — in other words
1000 degrees Centigrade — and 2000 Farenheit.

Q. These are physical changes, are they? A. Oh, yes.

Q. Are there any significant chemical changes? A. You wouldn't know that unless you made a complete chemical examination, which didn't seem useful in this case.

Q. Now I hand you what is marked plaintiff's exhibit 10 for identification and ask you about that? A. Well, now, this one has been run for five and one-half hours at 1120 degrees Centigrade. That is 2048 degrees Farenheit. There is considerable fissuring and the thing begins to look a little more rigid, and it is a little denser, you can't quite pull it apart with your fingers as you could with all lower temperatures, but you are beginning to get up to the temperature of where there is something significant starting to happen.

Q. Was there a specimen that showed a further drastic change at
a higher temperature? A. Oh, yes. We are supposed to have one
there that was run at 1150 Centigrade. That is 2102 degrees Faren-
20 heit. The thing is fused and, in fact, I can't get it out of the crucible.
So it is actually in the crucible that it was heated in. I do want to get
the crucible back. I need it again. But I just left it in the crucible so
you can see. There it is (indicating).

Q. I hand you what has been marked -- A. There it is still in the crucible, stuck to the crucible and very well fused.

THE COURT: It looks like slag from here.

THE WITNESS: Yes.

MR. MALLINCKRODT: I handed the witness what has been marked as plaintiff's exhibit 11.

THE WITNESS: You can't get it out. It is stuck.

BY MR. MALLINCKRODT:

Q. Now is it your understanding that that is well above the temperature specified in the Justheim application, 2000 degrees Farenheit? A. Yes. This is 2102 degrees Farenheit, and the patent specifically states you aren't supposed to fuse the thing. And you see, what we have established here is roughly the temperature which you want to avoid. The fact that you can't even get it out of the crucible leads to the belief that is a little above the temperature you want to get to.

Q. Have you any indication that there would be some cracking and
21 fissuring at temperatures lower than 1000 degrees Centigrade? A. Oh,
yes, we have run a series of specimens where the temperature starts
real low, 400 degrees Centigrade, 752 Farenheit; 760 degrees Centi-
grade, 1400 Farenheit; 850 degrees Centigrade, which is 1562 Faren-

heit. So we have three specimens in that exhibit that show what happened at lower temperatures. In fact, at 400 degrees Centigrade the oil shale is slightly baked and is still a little black yet. Hardly anything has happened to it.

Q. Dr. Schairer, would there be, in your opinion, any advantage in using a temperature at 2000 degrees Farenheit as specified by Mr. Justheim's patent application? A. Oh, very much so. There is a remarkable difference between these lower temperatures and this 2000 one. There has been a very pronounced change.

MR. MALLINCRODT: Thank you. You may cross-examine.

CROSS EXAMINATION

BY MR. SCHIMMEL:

Q. Doctor, in conducting your experiments, were the shale pieces open to the atmosphere or were they enclosed? A. They were open to the atmosphere, but you see, there would be a very limited quantity of 22 oxygen in a small bore furnace, so there would be a slight burning just to start with and as soon as the oxygen is gone then you don't have any.

Q. Do you believe that that represents completely the conditions that are described in the Ljungstrom patent? A. I think it represents very closely; yes.

Q. Would you say that if you had a completely enclosed chamber without any possibility of the atmosphere or the packing it in the same conditions that Ljungstrom describes that you might get a different result? A. I don't think so; no.

Q. Did you say that you used 1000 degrees Centigrade in your experiments? A. Well, in two experiments; yes. I described a whole series of experiments at temperatures of 400, 760, 850, two at 1000, one at 1050, two at 1093, one at 1120 and one at 1150. Where there were two at the same temperature there were different times to note the effect of time.

Q. Now in connection with the higher temperatures, is it your opinion that you cannot go above 2102 Farenheit and get the results that

Mr. Justheim describes? A. Well, he says don't go above fusion and that is fusion all right.

Q. But you can't go higher than that temperature? A. If you go
23 higher than that temperature you are in difficulty because of fusion.

Q. And you won't get the results that he is interested in? A. Well, I think you are going to begin to get into some difficulty. The minute you get fusion all this desirable fissuring will result in a slagging mass, so you have defeated the whole purpose.

Q. So you neither get fissuring if you go above that temperature, nor would you get necessarily the distillation from the oil or the organic material? A. I don't know about the distillation of the oil. I am only an expert on what happens when you heat rocks. You will have to ask some other experts on that.

Q. If you get fusion you won't get fissuring, is that correct? A. Well, if you have any fissuring and then you fuse the darn thing then you have lost the fissuring. And then, of course, you change the substantivity of the rock, you have got a completely different substance. That is something you might want to go into when you talk about heat conduction; and I am not an expert on heat conduction.

Q. Let me just get this clear here: As far as fissuring is concerned, you don't get fissuring — I gather from what you are saying —
24 at 1000 Centigrade? A. You get a little.

Q. You do get a little? A. Yes. You get fissuring at any temperature slightly because, remember, any oil shale is composed of a series of tiny beds one leg upon the other, so there is a bedding to the oil shale to start with.

Q. How would you characterize the difference of fissuring obtained at 1000 Centigrade and that obtained at 2000 Farenheit? A. Very minor at a thousand and very, very pronounced and very, very lovely structure at 2000 Farenheit, which is remarkable. You wouldn't expect it.

Q. You would not expect it? A. I would not; no.

Q. Even though you say you get some degree of fissuring even at very low temperatures, under 1000 Farenheit? A. That is right.

Q. Is it not progressive? A. No, it is very abrupt. If you look at the series of specimens -- That is why we brought them in. If you look at the series of specimens, there is a sudden and abrupt change above 1000 and most pronounced around this 2000 Farenheit of Justheim. To me, I don't see how he ever figured it out.

MR. SCHIMMEL: Thank you very much.

THE COURT: Have you any redirect?

25 MR. MALLINCKRODT: No redirect, Your Honor.

THE COURT: You are excused, Doctor. Call your next witness.

MR. MALLINCKRODT: Dr. Bonney, will you step forward, please.

Thereupon —

DR. DONALD T. BONNEY

was called as a witness by and on behalf of the plaintiff and, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. MALLINCKRODT:

Q. Will you please state your full name? A. Donald Theodore Bonney.

* * *

Q. And where do you reside? A. 1701 Utah Place, Baltimore, Maryland.

Q. What is your occupation? A. I am a Professor of Chemical Engineering at the University of Maryland.

Q. How long have you been with the University of Maryland?

26 A. Since 1937.

Q. What is your principal field in chemical engineering? A. It is chiefly thermodynamics and heat and mass transfer.

Q. Do you teach classes in that? A. Yes.

* * *

Q. What is your educational background? A. I have a Bachelor of Engineering Degree from Johns Hopkins University and a Doctor of Philosophy Degree from the same institution.

Q. And what was the Doctor of Philosophy Degree in? A. Well, in Gas Engineering, which at that time preceded Chemical Engineering at the Johns Hopkins University.

Q. Are you a registered engineer? A. I am licensed in the State of Maryland.

Q. Dr. Bonney, have you reviewed the two Justheim applications for patent involved in this suit? A. Yes, I have.

Q. Do you understand the disclosures in those applications?
27 A. I think so.

Q. Have you reviewed the Ljungstrom U.S. Patent Number 2,732,195 cited by the Examiner? A. Yes, sir.

Q. Do you understand that disclosure? A. Yes, I think so.

Q. Now have you checked the test specimens prepared by Dr. Schairer and which are now marked for identification as exhibits in this case? A. I have.

Q. Dr. Bonney, I hand you marked exhibits 7 and 8, which are specimens treated at 1000 degrees Centigrade, and ask you to comment on these from the standpoint of heat transfer characteristics? A. Well, these have been considerably calycined. I would judge it is chiefly a mixture of or a combination of oxide and magnesium calcium and maybe some silicon. I might point out that there have been very few openings within the sides due to fissuring.

Q. Dr. Bonney, I now hand you marked exhibits 9 and 10, which are specimens that have been treated -- 9 -- at 2000 degrees Farenheit, and 10 at 2048 degrees Farenheit. And I ask you to compare, first, exhibit 9 with these exhibits 7 and 8? A. Well, exhibit 9 evi-
28 dences considerable cracking because of the higher temperature.

Q. Dr. Bonney, would you characterize that as fissuring? A. Yes, it would be fissuring.

Q. And is that due to heat? A. Yes.

Q. Can you explain what effect the difference in heat has had with respect to those different specimens? A. Well, between the three temperatures there is considerable more fissuring as we go up in temperature within the temperature range. This would lead to the formation of channels ahead of the fusion zone, or the pyrolysis zone, so the heat could be conducted by convection rather than thermoconduction into the plastic zone, so-called pyrolysis zone. So I would say that the exhibit 10 of these three would be the optimum condition of the temperature operation.

Q. And that is 2000 degrees Farenheit. A. Yes.

Q. Could you characterize the action that takes place there as a thermo-driving force or something similar? A. Well, we have a thermo-driving force from a heat source, of course, throughout this. And, of course, as the temperature rises, the bedrock temperature, beyond this zone where heat is effective at considerably lower temperatures; so the higher the temperature of the heating zone actually
29 the greater driving force. Therefore, the faster gases will be evolved when we gasify or volatilize the hydrocarbon present, the carbonation material present in the shale itself. We have a lot higher driving force if we tend to erupt the gases more violently and cause cracking.

Q. Dr. Bonney, you have heard Dr. Schairer's testimony, to the effect that there is no significant difference in time so far as the action on specimens are concerned. Now considering that, can you tell us what would happen in the Justheim situation using 2000 degrees Farenheit so far as the bed of oil shale being treated is concerned? In other words, you have said that there would be considerable fissuring. Now we know that there is not going to be any change, from Dr. Schairer's testimony, at the higher heat. Now what would happen beyond the immediate vicinity of the bore hole where the heat is applied? A. Well, at this lower temperature, inspecting this sample --

Q. Which sample are you referring to? A. That is number 8.

Q. That is 1000 degrees Centigrade? A. This is 1000 degrees.

There are no marked channels through which heat could be conducted by convection. Our best method of conducting heat in the same sit-30 uation having the oil shale underground would be by convection, if possible. The rate of heat transfer by direct induction is considerably slow, slower, and depends upon the material. And this sample approaches what we use for insulation material.

Q. Let the record show that the sample Dr. Bonney was speaking about at that moment was -- A. Number 8. The only explanation I can make of this is that we do have this -- I mean our driving force has increased. I will consider that 1800 to 2000 is only 200 degrees, but 200 degrees is considerable driving force. And, of course, we have probably not too much radiation here, but to the extent that the radiation -- that one particle can see another particle, that would amount to, since radiation is a force power of absolute temperature, you have the difference between 1800 and 2000, which would magnify it one and one-half times. I am not saying that radiation plays too important a part, but it does play some part in it because one body does heat the body next to it; and these temperatures are such that radiation effects can be high.

Q. You have previously spoken about convection, Dr. Bonney, and about the fact that at the 2000 degrees Farenheit and somewhat above you get considerably greater fissuring than at 1000 degrees Centi-31 grade. Now can you express an opinion as to the effectiveness of -- the difference in effectiveness -- between treating an oil shale body as Justheim has disclosed it at 2000 degrees Farenheit in comparison with what Ljungstrom has disclosed as his top temperature of 1000 degrees Centigrade, which is 1832 degrees Farenheit? A. Well, based on these samples of this shale, which I understand represents shale --

THE COURT: You had better identify it by number.

THE WITNESS: Well, it is Utah --

MR. MALLINCRODT: Just the number.

THE WITNESS: Oh, number 10. There would be the operation of this distillation in situ which would be enhanced enormously over this 200 degree range, due to the fact that we have opened up channels, fissurable channels, where our gases can travel away from the hot zone carrying thermal energy with it to continue the pyrolysis further out. There is a considerable and rather surprising difference between the two.

MR. MALLINCRODT: Thank you, Dr. Bonney.

CROSS EXAMINATION

BY MR. SCHIMMEL:

Q. Dr. Bonney, is it to be expected as the temperature to which the shale is subjected increases you would get an increased fissuring effect? A. Yes, sir, because of the higher driving force. The rapid-
32 ity of the reaction of the bases could not diffuse as readily, therefore,
they would tend to build up pressure and blow fissuring.

Q. In your reading of the Ljungstrom patent, would you say that to accomplish the result that he says he gets there would have to be fissuring of the shale? A. Oh, there is fissuring to some extent.

Q. And would you say it would be expected if you raised the temperature above what his maximum temperature is, you would expect to get increased fissuring? A. Yes, sir.

MR. SCHIMMEL: Thank you very much.

THE COURT: Have you any redirect?

MR. MALLINCKRODT: Yes, Your Honor.

REDIRECT EXAMINATION

BY MR. MALLINCKRODT:

Q. Dr. Bonney, you have indicated that you would expect to get greater fissuring with greater thermal driving force. Could you expect that the relatively small difference in temperature between 1000 degrees Farenheit -- I am sorry. I mean 1000 degrees Centigrade, 1832 degrees Farenheit, and 2000 degrees Farenheit would give the great difference in fissuring effect that both Dr. Schairer and you

have testified to? A. Normally I would not have expected this. Hav-
33 ing seen it I have then tried to reason it, and it does seem in line with any theoretical consideration. Up until the time where we would start to fuse and change the structure and absorb the heat by rate of fusion, up until that time, as it magnified the thermal grading, the driving force behind this, we would expect considerable greater activity because of the building up of pressure rapidly, developing the gases rapidly. And they have to go some place and expand. And also the thermal shock is greater. So that not only do we have more driving force of gases trying to escape, but we have probably a thermal shock as well because of the sudden temperatures. It is like plunging a piece of glass into a water pail; it will shatter. It will have somewhat that tendency.

Q. Now 1000 degrees Centigrade is fairly close to this higher temperature that Justheim has disclosed, isn't it? A. Yes.

Q. Then do I understand you to say, that given those fairly close temperatures that you wouldn't expect much difference there? A. I would have not. I would not had I not seen these samples.

MR. MALLINCRODT: Thank you.

THE COURT: Have you any recross?

34 MR. SCHIMMEL: I have no recross, Your Honor.

THE COURT: Call your next witness.

You are excused, Doctor.

MR. MALLINCRODT: Mr. Huntington, will you step forward, please.

Thereupon --

MR. MORGAN G. HUNTINGTON

was called as a witness by and on behalf of the plaintiff and, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. MALLINCRODT:

Q. Will you please state your full name? A. Morgan Gurdon Huntington.

Q. And where do you reside? A. Galesville, Maryland.

Q. What is your occupation, Mr. Huntington? A. I am a process inventor and I head several corporations which hold and promote various patents.

Q. Can you give me a brief summary of your educational background? A. I have a degree in mining engineering from the University of Nevada; and I have had other education not directed toward obtaining a degree.

35 Q. Have you had any practical experience in mining prior to the time you were concerned with patents? A. I practiced mining engineering for about twenty years in Europe.

THE COURT: Whereabouts?

THE WITNESS: I was manager of the Kapaonik Mine in Yugoslavia for Trepca Mines, Limited.

THE COURT: Are their methods about the same as ours?

THE WITNESS: Well, there were two, the Trepca proper, the large mine, used flat-back cut and fill.

THE COURT: Was this a pit mine?

THE WITNESS: No, sir. It was an underground mine but I used --

THE COURT: Instead of using rigging you filled in as you went along?

THE WITNESS: Well, at Stan we only had one stope, but this was open, cut and fill supported on pillars. And we would mine two meters and fill two meters. And it was cut back and fill as we broke the masses down on the job. At Kapaonik where I became manager of the mine it was somewhat smaller, but I still had 610 men there underground. That was almost all square set.

THE COURT: Well, that is really the old method, square set.

36 THE WITNESS: Well, it is the function of the character of the ground, sir. Square set means that you can't open anything. The square set consists of a cap opposed to a girt and two cubic meters as --

THE COURT: I am very familiar with them. I used them myself in Montana.

THE WITNESS: Is that right?

BY MR. MALLINCRODT:

Q. Mr. Huntington, have you prepared a resume of your occupational and educational experience? A. Yes, sir.

THE DEPUTY CLERK: Plaintiff's Exhibits 12 through 13 are marked for identification.

(Plaintiff's Exhibits Nos. 12, 13, 14, 15, 16, 17 and 18 were marked for identification.)

BY MR. MALLINCRODT:

Q. I hand you what has been marked for identification plaintiff's exhibit 12 and ask you whether that is a copy of the vitae that you prepared? A. Yes, that is up to the date of October 20th, 1962.

Q. And that was compiled by you and represents a true summary of your occupational and academic background? A. Yes, sir.

37 Q. Now I notice, Mr. Huntington, from this list that in 1957 and 1958 you were Chief Construction Engineer of the Nuclear Products Branch of ACF Industries, Incorporated; is that correct? A. Yes, sir.

Q. And what is ACF Industries, Incorporated? A. Well, that was the old American Car and Foundry Company, and they had a nuclear branch; and during that time I was in charge of the construction of five nuclear reactors.

Q. What were those reactors? Identify them. A. Well, there was one light water reactor at Petten, Holland, and one at Studvik, Sweden. Those were the light water reactors; and then there was another one at Wright Patterson Air Force Base for radiation of whole components of aircraft. And then there were two heavy water machines. We built one at M.I.T. for radiation of cancerous tissue and that sort of thing; and then one at Milano, Italy, of the same type without the medical facilities.

Q. Now in addition to this construction experience that you had with nuclear reactors, have you made a study of nuclear reaction?

A. It was necessary for me to study nuclear physics and nuclear fuels and power reactors.

Q. I notice from this exhibit 12 that you have listed courses 38 taken, apparently, at the University of Maryland. There are four courses: Nuclear Power Reactors, Nuclear Research Reactors, Nuclear Fuels and Nuclear Physics. Was that at the Unversity of Maryland? A. No, sir. That was done under Dr. M. M. Shapiro, an instructor hired by the ACF Industries. And I took those special courses courses. In fact, I was the only one who completed all of the courses.

Q. And who was Dr. Shapiro with? A. The Bureau of Ordnance Laboratories. He was with Dr. Ebbington on the development of the submarine reactors.

Q. Based on this experience and this academic approach, do you feel that you have a background in nuclear reactors which would enable you to speak with regard to the disclosure in the Justheim patent applications? A. Yes. I have patents in Great Britain, Japan and Canada that have to do with reactor configurations, methods, controls, et cetera, and I have a number of applications in this country.

Q. I hand you plaintiff's exhibit 5 and ask you whether that is your patent? A. Yes, sir. This is a Canadian patent on what I call a "Radiant Nuclear Boiler". It is a steam raising reactor.

39 Q. Will you describe briefly the nature of that reactor? A. Yes, sir. This is a little different technology than has been developed in this country, in that I use unclad fuel elements running at quite high temperature, and the initial transfer is by radiation to water tubes which use light water and complete moderation. The reactor is under-moderated in respect to the graphite core and, therefore, it is always safe and requires no control rods of any kind; and the neutron economy is much improved by it.

Q. At what temperatures do the fuel elements operate at?

A. The fuel elements are uranium carbide contained in graphite and operate up to the sublimation temperature of uranium carbide; and also they operate above the temperature at which the various fission products sublimate, vaporize and leave a fuel element and, therefore, the fuel elements are self-cleaning; so the temperature is above 4000 degrees Farenheit. It is in that order.

Q. But that is specified in the patent? A. Yes. I have written quite a number of these and --

Q. Now you have indicated that this is a little different type of reactor than had been developed heretofore. Do you know of any reactor that had been developed prior to 1955 that used unclad fuel elements and would operate at a temperature of at least 2000 degrees Farenheit? A. Yes, sir. There was quite a lot of work done before 1950 by the corporation under contract to the Atomic Energy Commission. And I have learned, to my surprise, yesterday that that material is still classified. I know that it exists. I know the work was done. I know that those elements operated as high as 3500 degrees Farenheit and, evidently, I am not at liberty to state the details of it, but there isn't any question but that unclad elements operated at the order of 3500 degrees Farenheit before 1950.

Q. And this was a reactor that had been designed -- A. Designed to heat, use gases as coolants. Helium was the gas used in that particular case.

Q. Now with a reactor of that type, I understand there are unclad fuel elements operating at at least 2000 degrees Farenheit, could you use such a reactor in connection with the disclosures of the Justheim patent applications? A. Yes.

Q. Let me ask you first, are you familiar with the Justheim patent applications? A. I am.

Q. Then answer the other question, please. A. Yes, you could use unclad fuel elements in connection with it.

Q. Now will you tell me how you, if you were to do it, would use

41 such a reactor in connection with what Mr. Justheim has taught in his patent application? A. Yes. I would pass a non-reacting gas over the fuel elements themselves and use that as the thermal carrier medium, which would effect the distillation for shale and recirculate the thermal carrier medium after separating from the volatile products and transfer it through the reactor.

It is technically feasible.

Q. How would that gas be handled in the bore hole? A. The conduction of gases at high temperature requires insulation, and I have experienced handling hydrogen at 2500 degrees Farenheit under pressures much higher than you are talking about here; and we can conduct them with reasonable heat losses without subjecting the pressure shell to anything but hoop stress and keep the thermal stress separated; thermal chemical stresses.

Q. Now if a shale or body were fissured, could the heat be disseminated throughout the formation? A. I am sorry. Do you mean fractured ahead of the thermal application?

Q. That is right. A. Well, as Dr. Bonney pointed out, if you have openings you can have mass transfer of your thermal carrier medium by convection and you have a means of rapidly transferring the heat from a gas to a solid.

42 Q. Now you have indicated that you have been working with patents and have obtained some patents. Have you made a compilation of those patents which you have obtained? A. Yes, sir. There is a letter here from one of the attorneys I have been working with for the last six years which lists the work that he has done for me.

Q. And do any of those patents deal with oil shale? A. Yes, sir. I have one in situ patent allowed with 8 claims; and I have had another one which issued this last October that has to do with oil shale and it has 14 claims. And I have quite a number of applications.

Q. Were you making reference to the letter from your patent lawyers, Sughrue, Rothwell, Mion and Zinn, dated January 29, 1964, identified as plaintiff's exhibit 13? A. Yes, sir.

Q. Now you mentioned one patent that you obtained on the treatment of oil shale in situ. Are there other patents that deal with oil shale? A. Yes, sir. There is that one in situ, number 2,969,266, with 8 claims. And then there is another one which has issued with 14 claims. That is 3,106,521. And there are quite a number of applications in the same field that have not been acted on yet.

43 Q. Does this exhibit 13 truly reflect the patent applications that you have made and the patents that have been granted to you? A. Up until January; yes, sir.

MR. MALLINCKRODT: I offer that in evidence.

THE COURT: Have you a copy of that, Mr. Schimmel?

MR. SCHIMMEL: I have a copy, Your Honor.

THE COURT: Very well. Have you any objection?

MR. SCHIMMEL: No objection.

THE COURT: You have offered it, have you?

MR. MALLINCKRODT: Yes, sir. Your Honor, I have neglected to offer the specimens. I would like to offer --

THE COURT: You have several that you haven't offered in evidence yet that have been marked for identification.

MR. MALLINCKRODT: Yes, Your Honor, and I can offer them right now, and I would like to do so on the basis of the testimony that has been given.

THE COURT: Very well.

MR. MALLINCKRODT: These are --

THE DEPUTY CLERK: Plaintiff's Exhibits 6 through 13.

MR. MALLINCKRODT: I would like to offer those.

MR. SCHIMMEL: No objection.

THE COURT: They may be marked in evidence.

44 THE DEPUTY CLERK: Plaintiff's Exhibits 6 through 13 are marked in evidence.

(Plaintiff's Exhibits Nos. 6, 7, 8, 9, 10, 11, 12 and 13 were received in evidence.)

THE COURT: It is time now for the usual morning recess. Court will now stand recessed until 11:30.

THE DEPUTY MARSHAL: This Honorable Court now stands recessed until 11:30.

(Whereupon, at 11:15 a.m. the Court recessed as noted.)

45 AFTER RECESS 11:35 a.m.

THE COURT: The witness will resume the stand. You may continue, Mr. Mallincrodt.

BY MR. MALLINCKRODT:

Q. Mr. Huntington, I hand you four patents marked for identification as plaintiff's 14, 15, 16 and 17, and ask you whether these are copies of the patents that were issued to you and were listed on exhibit 13?

THE COURT: Do you have copies?

MR. SCHIMMEL: I have copies, Your Honor, except for one.

THE WITNESS: Yes, these are all my inventions having to do with oil shale and coal, etc.

BY MR. MALLINCKRODT:

Q. Now going back to this reactor about which you have testified previously, the one that you have indicated was designed and could opoperate at at least 2000 degrees Farenheit with unclad fuel elements, can you tell us who developed that reactor? A. That was North American Aviation Company under contract to the Atomic Energy Commission. At least they did the original work in that type of fuel elements and moderators, etc.

Q. Now based on your knowledge of the art of oil shale and the nuclear energy art, and on the basis of the testimony of the two wit-
46 nesses who preceded you today, and of your review of the two Justheim patent applications, can you tell me whether, in your opinion, the Justheim process disclosed in those applications is theoretically possible? A. It is theoretically possible; yes, sir.

Q. Now is it technically feasible? A. It is technically feasible.

Q. I hand you plaintiff's exhibit 1, which is the prosecution history of the first Justheim patent application filed September 28, 1955, and I turn to page 11 thereof and point to the third paragraph on that page and ask you whether the description there ties into the proposed operation that you previously testified about with the reactor of North American Aviation, that you previously testified about as existing prior to 1955? A. Yes, sir. This paragraph 3 discloses the heating of a gas by direct contact with the nuclear fuel element and using the heated gas as a thermal carrier medium for heating oil shale, which is typical of a gas-cooled reactor using unclad elements.

Q. Now based on your knowledge of the reactor about which you have testified, your knowldge of the oil shale industry or art, I should call it, and the disclosure that you have just read, would you have been able to practice the invention that is disclosed in this application? 47 In other words, is there an adequate disclosure to one skilled in the art? A. Well, to me it is adequate.

Q. And do you consider yourself a person skilled in the art? A. Yes, sir.

Q. I hand you a copy of the Ljungstrom patent 2,732,195, which is a portion of defendant's exhibit 1, and I ask you whether you have previously reviewed that patent? A. Yes, sir. I have.

Q. You are aware, are you not, of the temperature range that Ljungstrom specified? A. Yes, sir.

Q. Will you give that range? A. 500 to 1000 degrees Centigrade.

Q. Now I call your attention to column 1 of that patent, to the portion which reads: "The temperature in the heat supply channels" —

THE COURT: Which line are you referring to in column 1?

MR. MALLINCKRODT: Starting at line 26.

THE COURT: Oh, yes.

BY MR. MALLINCKRODT:

48 Q. (Reading) "The temperature in the heat supply channels should be considerably higher than the temperature, at which the distillation products are produced, in order to extract the same within a reasonable time. This high temperature has in the processes hitherto known an unfavorable influence on the oil products in so far as they are to a high extent carbonized and converted to non condensable gases."

Now in view of the statement -- Strike that.

Let me ask you first: What is the normal distillation temperature of the character and content of oil shale? A. It is a fairly long answer, in that there is no clearly established lower limits. It is rather a function of time. Beginning at somewhat below 700 degrees Farenheit there will be some pyrolysis changing character of the oil shale, hydrocarbonation impregnation, from being an inorganically — I mean — insoluble in an organic solvent. It is originally insoluble in —

Q. What is the top temperature normally associated with the complete distillation of the shale? A. All of the condensable volatile matter have left the shale by the time it has reached 900 degrees Farenheit. That is 500 degrees Centigrade would be 932.

Q. So Ljungstrom's lower limit of 500 degrees Centigrade is somewhat above the temperature at which the kerogen would be com-
49 pletely distilled? A. If you could apply the temperature of 500 degrees Centigrade all of the volatile matter would leave within two or three minutes.

Q. So 500 degrees fits in with this first statement in column 1 that we have read as a lower limit to his, and then his 1000 degrees Centigrade is about twice that; isn't it? A. Yes, sir.

Q. Now as one skilled in the art, given that temperature range by Ljungstrom, what would you normally select as the optimum temperature to use in connection with his process? A. He has given you the minimum that he could use and get any result at all. This is the temperature of his source, and he is giving you the maximum he can stand and generate with that source. And, in the interests of economy, he would operate somewhere in between those two limits that he has given.

Q. And as one skilled in the art reading his patent, would you operate between those limits that he has indicated? A. If I wanted the heating elements to last a reasonable length of time I wouldn't operate at the top temperature certainly.

Q. And would that be true also with respect to the processing the shale? I mean with respect to the operation of the process as he discloses it in this first column telling or summing up what he wants to accomplish, would you work between those ranges? A. Well, with this device you would have to.

Q. Yes. I am saying would you, on the basis of his disclosure, do that? A. Yes, sir.

Q. Now I hand you a copy of Section D of defendant's exhibit 1, which is a publication by Uren "Petroleum Production Engineering, Oil Field Development" and I ask you to tell me what that means to you as one skilled in the art? A. Well, routinely, the increasing the interstitial space of oil impregnated medium around an oil well requires either blasting or treatment with acid or some sort of thing of that kind. This is typical oil well completion. It is usually done with nitroglycerin.

Q. Would the combination of the knowledge imparted by Ljungstrom and the knowledge imparted by this Uren publication lead you as one skilled in the art naturally and normally to this invention disclosure that Mr. Justheim has made? A. No, sir.

MR. MALLINCRODT: I offer the exhibits marked for identification 14, 15, 16 and 17 in evidence.

MR. SCHIMMEL: May I make a comment with respect to those, Your Honor?

51 THE COURT: You may.

MR. SCHIMMEL: I call attention to the fact that the dates of those patents are — filing dates — 1960, long subsequent to the filing of this application involved in this suit. I fail to see any relevancy.

THE COURT: How are they material here?

MR. MALLINCRODT: Your Honor, they are material merely to establish Mr. Huntington's knowledge of the art and his working in the art.

THE COURT: Well, for that purpose, I will admit them.

MR. SCHIMMEL: Well, I assumed that was done by the plaintiff's exhibit 13. I see no reason for the specific patents themselves. Those patents are listed on plaintiff's exhibit 13. With these late filing dates, it seems to me they are absolutely immaterial and irrelevant to any issue in this case.

MR. MALLINCKRODT: Merely to show his experience in the field prior to this testifying date.

THE COURT: Well, it is cumulative evidence, I guess. That is the worst I can say about it.

MR. SCHIMMEL: It clutters the record, as far as I can see.

MR. MALLINCRODT: Your Honor, I offer it only to support Mr.
52 Huntington as an expert witness as of the time he is testifying. I
don't propose to carry this back.

THE COURT: Don't you think a list of these U.S. patents is the same thing?

MR. MALLINCKRODT: There is a listing but I thought Your Honor might like to see the patents themselves. It really makes no difference to me. It is just for the convenience of the Court.

THE COURT: I am convinced that the witness is fully qualified to testify as a man who is skilled in this science or art, or whatever you want to call it. I don't see any necessity of putting these things in and, as Mr. Schimmel says, it would make the record pretty thick.

MR. MALLINCKRODT: Under those circumstances, I am perfectly willing not to --

THE COURT: You are not suffering any by it at all.

MR. MALLINCKRODT: Thank you, sir. Mr. Schimmel, you may cross-examine.

THE COURT: You can't finish your cross-examination in five minutes, can you?

MR. SCHIMMEL: No, I don't think so, Your Honor.

THE COURT: You know what I told you about that engagement that I have. So we will assume that it is nunc pro tunc 12:00 o'clock now. So we will recess until return of Court this afternoon.

53 THE DEPUTY MARSHAL: This Honorable Court stands recessed until return of Court this afternoon.

(Whereupon, at 11:55 a.m. the Court recessed as noted.)

54 AFTERNOON SESSION, 2:45 P.M.

THE COURT: Gentlemen, I am very sorry that I kept you waiting so long. City traffic doesn't wait for anybody. I left in time to be here at 2:30. Here it is quarter to 3:00. I have only one consolation and that is rather macabre too. They couldn't start -- you know, the man who was to be hanged -- until he got there.

How many more witnesses will you have?

MR. MALLINCKRODT: This is my last witness, Your Honor.

THE COURT: Oh, well that is all right.

CROSS EXAMINATION

BY MR. SCHIMMEL:

Q. Mr. Huntington, I hand you plaintiff's exhibit 2, which is the certified copy of the Justheim application involved in this civil action, Serial Number 785552, and ask you to turn to page 11 of that certified copy, where there appears this sentence, and I quote: "A satisfactory type of nuclear reactor for the purpose is disclosed in the application for patent of Morgan G. Huntington Serial No. 776,465, filed November 26, 1958, entitled 'Radiant Nuclear Boiler'." And I ask you are you the Morgan --

THE COURT: Did you say '58?

MR. SCHIMMEL: Yes, sir, '58.

55 BY MR. SCHIMMEL:

Q. Are you the Morgan G. Huntington referred to there? A. Yes, sir.

Q. And is that application Serial Number 776,465 an application of yours that was filed in the U.S. Patent Office? A. Yes, sir.

Q. Was there a patent issued on that application? A. Not in the United States; no, sir. It is still pending.

Q. It is still pending? A. Yes, sir.

Q. That particular application, do you know? A. It is still pending; yes, sir. There has been a continuation-in-part. "The Office Action requested that it be divided into five parts without rejection of claims.

THE COURT: Was a division required by the Patent Office?

THE WITNESS: In this last Office Action there were five divisions.

THE COURT: Required?

THE WITNESS: Yes, sir.

BY MR. SCHIMMEL:

Q. I hate to disagree with the witness here, but I would like to
show him a copy of that application. I have the official file of your
56 application here, 776,465, and on December 13th, 1963, there was
filed in the Patent Office this communication. Do you know about
that, in which the drawings were transferred from this application
to an application filed in December 1963? A. Yes, sir. That is the
one I referred to that they requested that it be divided. It is a continuation-in-part.

Q. A continuation-in-part was filed in December, 1963? A. I might be mistaken about the technical name.

Q. Just to clear the record, you are mistaken. This application is now abandoned in favor of your continuation-in-part application. A. Yes, sir.

Q. So we get that straight on the record. I show you Canadian patent Number 658,889, which is plaintiff's exhibit 5, and call your attention to the fact that on the front of that exhibit there is a reference to a United States application that was filed on November 26, 1958. Is that the previous application of yours we were referring to? A. I beg your pardon.

Q. In the lower left-hand corner there is a reference to a "Priority Date Nov. 26, 1958 U.S.A." Is this the -- A. That must be; yes, sir.

Q. Do you know whether this Canadian application was a dupli-
57 cate of this prior U.S. application? A. The exact duplicate, I pre-
sume it was; yes, sir. The drawings look familiar.

Q. Now looking at that Canadian patent, would you agree that nuclear reactor described in that patent is of the general pile type of nuclear reactor? A. I don't know what you mean by the "general pile type".

Q. Let me ask it this way then: Is it a homogeneous reactor? A. No, sir.

Q. Is it a heterogeneous reactor? A. Yes, sir.

Q. Now in a heterogeneous reactor, is it true that you have a nuclear fuel core surrounded by a mass of graphite moderator? A. No, sir. Well, the core is moderated on a specific lattice and surrounded by a reflector, not a core.

Q. What is the moderator? A. The moderator -- In the case of this particular one, do you mean?

Q. Yes. A. There are two moderators. This is undermoderated in respect to graphite. There isn't enough graphite in there to moderate it by itself.

58 Q. Let's look at the graphite moderator for a moment. Is the
nuclear fuel imbedded in that graphite moderator? A. The fuel is
inserted on a lattice, and the ratio of moderator atoms to uranium
atoms is such that this particular reactor is undermoderated in re-
spect to carbon and the moderation is completed by light water.
That is the means of control.

Q. Is the light water a coolant for the nuclear reactor? A. It is also a coolant.

Q. Now, insofar as the nuclear fuel is concerned, I believe you said that the nuclear fuel in that reactor reached a temperature of about 4000 Farenheit; is that correct? A. That is correct.

Q. That is the temperature of the nuclear fuel itself, is it not? A. Yes, sir.

Q. Is that same temperature the temperature of the surface of the reactor? A. The temperature of the uranium carbide suspended in the graphite pores reaches that temperature.

Q. What about the surface of the reactor? A. By the reactor, do you mean --

Q. The whole complete device. Not the fuel now. The moderator is surrounded by a shielding device, you say, is it not? A. Do
59 you mean the outside of the shielding?

Q. Yes. A. It is not even warm.

Q. What is the inside of the shielding? A. The inside of the shielding is the reflector core which is in the order of say 1000 degrees Farenheit, something like that.

Q. So there is a temperature differential from the fuel to other portions of the reactor? A. The shielding is, again, water-cooled in this particular reactor; yes, sir.

Q. Now the water-coolant used in the reactor, what is the temperature of the water-coolant? A. The maximum temperature of the water-coolant is a saturation temperature of water at 1000 degrees Farenheit. I think that is the example I used in here. I haven't read this for some years, I guess.

Q. Could you give us any estimate of what that temperature would be? A. I would estimate it offhand to be 440 degrees Farenheit. I may be wrong. That is the temperature of the water. The temperature of the steam you didn't ask me.

Q. The water is converted into steam, is it not? A. At the

same time moderation is completed the tubes in the core are evapo-
60 rated tubes, and then in the reflector around the reactor is the
steam. The wet steam is super-heated to 1000 degrees Farenheit.

Q. And the maximum temperature of the super-heated steam would be about 1000 degrees Farenheit? A. That is right, because of the metallurgical element of the tubes; yes, sir.

Q. Now looking at figure 1 of the Justheim application involved in this proceeding, where he refers to a nuclear reactor, supposing that your nuclear reactor that you have described in the Canadian patent is substituted and used as the nuclear reactor in this figure 1, would a temperature of 2000 degrees Farenheit be obtained at the bottom of the drill hole? A. With certain modifications; yes, sir.

Q. Now let's look at what is shown there in the figure. Is the heat of the nuclear reaction directly or indirectly applied to the bore hole? A. Limiting this to what?

Q. I am looking at this figure. What does it illustrate? Does it illustrate a direct or indirect application of the heat of the nuclear reactor to the bore hole? A. As it is here?

Q. As it is here. A. Yes.

61 Q. Is it direct or indirect? A. Indirect.

Q. And it is indirect by virtue of a coolant circulating through the nuclear reactor, isn't it? A. And the subsequent heat exchanger; yes, sir.

Q. Now assuming that the coolant itself -- Strike that. Let me ask you this: Do you recollect what Mr. Justheim discloses in this case as the coolant for the reactor? A. Well, in the original case -- Do I go back to the original?

Q. No, I am talking about this particular one that is involved in this proceeding first. A. Well, he has mentioned several gases.

Q. Let me call your attention to the last paragraph on page 6. A. He says sodium here.

Q. Now assuming that he is using sodium as the coolant in figure 1, and is it molten sodium? A. It is.

Q. It is in the specification, is it not? A. Yes, sir.

Q. Assuming molten sodium is used as the coolant in the nuclear reactor shown in figure 1, and assuming that you used your 62 nuclear reactor as the nuclear reactor, what would be the temperature, the maximum temperature, that could be obtained by the use of that coolant? A. Under those conditions it would be the temperature at which the vapor pressure of sodium was.

Q. Have you any idea what that would be? A. Well, I would say that 1400 degrees Farenheit would be maximum.

Q. Would it be fair to say it would not be 2000 degrees Farenheit? A. It would not be 2000 degrees Farenheit.

Q. Now Mr. Justheim also discloses, does he not, that he can use a secondary heat exchange instead of the primary heat exchange with molten sodium? Do you recollect that? A. Yes, using gases directly.

Q. And using water or steam, does he not also disclose that? A. Yes.

Q. Now, again, supposing you are using your reactor for the reactor in figure 1 of Justheim, and using water or steam such as you disclose in your reactor as the coolant, would it be possible to obtain at least 2000 Farenheit temperature at the bottom of the drill hole? A. No, sir.

63 Q. Now looking at figure 4 of the Justheim application, are you familiar with the nuclear reactor that is disclosed there? A. Well, I am familiar with the concept.

Q. In that concept does he also describe the use of a nuclear fuel and a graphite moderator? A. Yes.

Q. Does he anywhere in his application indicate what the temperature of the nuclear fuel is? A. He is using the figure 2000 degrees Farenheit.

Q. In the nuclear fuel, or are you meaning 2000 Farenheit as the temperature in the drill hole? A. That is his objective. I don't recall that he specifies the temperature of the fuel element itself.

Q. Let me ask you this then: As an engineer in nuclear operations, could you put your nuclear reactor in figure 4? A. Underground; no, sir.

Q. Do you recollect whether the first application that was filed by Mr. Justheim had or did not have figure 4 in it? A. No, sir, this is not in the first one.

Q. And is it fair to say that the first application was limited to the figures of the drawing exclusive of figure 4? A. Yes, sir.

64 Q. Now at the time the Justheim application involved in this case was filed in 1959, do you know whether there was available to the public any information concerning a nuclear reactor capable of producing temperatures in excess of 3000 degrees Farenheit? A. Now, when you say available to the public --

Q. That is right. Any information available to the public. A. Yes, there must have been, because reactors with unclad fuel elements by Farrington Daniels -- I recall one now where he circulated a gaseous coolant through nuclear fuel elements in pebble form.

Q. Now I am speaking in terms of the filing date of this particular application, which is April, 1959. A. Now I know I had information. Now when you say "available to the public" I don't know why it isn't available to the public. There was work done before 1950, quite extensive work done by a private contractor to the Atomic Energy Commission, and I was familiar with it several years ago. And suddenly yesterday I found out -- somebody told me -- that is restricted; and I don't know that that is true.

Q. Let me show you patent number 3,028,330 and ask you whether or not you are the Morgan G. Huntington referred to as one of the joint inventors in that patent? A. Yes, sir.

65 Q. May I refer you to the second sentence in the second full paragraph in that patent and ask you to read that into the record? A. (Reading) "No presently known system of nuclear fuel contain-

ment is adequate for operation at temperatures of high incandescence, i.e., above 3000 degrees F." At that time I believed that to be true; yes, sir.

Q. Do you see what the filing date of that application is? A. Yes, sir. We filed that April 7, 1959.

Q. Now on April 7, 1959, you believed at that time there was no known system of obtaining such a temperature in a nuclear reactor? A. That is right.

Q. Now I asked you the question with respect to 3000 Farenheit. Now I am going to ask you the question with respect to 2000 Farenheit. Do you know whether there was any information available publicly, again, prior to the filing date of the Justheim application which disclosed a nuclear reactor, and in which the operating temperature was in excess of 2000 Farenheit? A. Yes, I knew that there had been at that time graphite blocks impregnated with uranium nitrate that operated at fairly high temperatures and --

66 Q. That was your personal knowledge? A. Yes.

Q. You do not know what -- A. You are asking me to tell you to what degree the A.E.C. has released this information or to what degree they kept it back. That I don't know.

Q. No, I am just trying to differentiate between your own personal knowledge and what might be said to be prior art knowledge, knowledge that might be available to the public. A. Well at this time there was a great mass of stuff released and that is a question I simply can't answer, whether it was released. The facts are this, that the A.E.C. had knowledge and had experimented on elements that would operate in this temperature order. Whether or not it is public information or not I can't answer you.

Q. You were asked the question, I believe, on direct examination whether you knew of any reactor prior to 1955 using an unclad fuel nuclear fuel which operated at 2000 degrees Farenheit. And I believe you said that you did know of it but it was classified material. A. Well, I didn't say it was classified. I said I heard it was classified. Now there is a great volume of stuff, it is so arbitrary, what 67 is classified and what isn't, I don't know.

Q. As far as the answer to that question -- I just want to clarify it -- it is your own personal knowledge, is it not? A. My personal knowledge is that fuel elements were operated a[t] high temperatures of incandescence. I know that now. My information when I wrote this particular patent application was that for many physical reasons the impregnated graphite fuel elements, that is impregnated with a solution of uranium nitrate, could not be operated at the order of 3000 degrees Farenheit because it decrepitated, broke up.

Q. Now there was placed in the record here as plaintiff's exhibit 4 patent number 2,990,348, and I assume that the purpose was for showing that there was available knowledge at least, because the patent issued in 1961, subsequent to the filing date of the Justheim application. I would like to ask you if you find anywhere in that patent that the coolant used in the nuclear reactor was at a temperature of at least 2000 degrees Farenheit? A. The temperature of the coolant?

Q. The coolant, yes. A. Well, this is a water-cooled reactor, evidently steam-cooled, isn't it?

68 Q. It is a steam-cooled reactor. Could it possibly have a temperature of 2000 degrees Farenheit? A. No, sir.

Q. I also show you plaintiff's exhibit 3, which is patent number 2,992,981, applied for on October 29, 1953, and granted July 18, 1961. And calling your attention to column 3 of the patent about midway down, I ask you if that does not state that while the nuclear fuel may be operating at 2500 degrees F., the coolant air is at a much lower temperature, around 1400 F.? A. Yes, sir.

Q. So even in that particular instance, there is no disclosure, is there, of a coolant coming out at least 2000 Farenheit? A. No, sir, there isn't.

Q. There is none? A. No, sir.

Q. Now you were asked on direct examination, that based on your own knowledge with respect to the testimony and based on the testimony of prior witnesses with respect to the oil shale reaction under heating conditions, whether or not the disclosure of this application involved in this proceeding described a process which is theoretically possible. A. It is theoretically possible.

69 Q. And you were also asked whether it was technically feasible? A. Well, there isn't much difference between theoretically possible and technically feasible. That doesn't imply it is operable.

Q. Let me get that again. It doesn't imply that it is operable? A. That is it economically operable and that sort of thing.

Q. Would it be operable to obtain a temperature of at least 2000 Farenheit from the coolant? A. Unclad reactor elements, uranium carbide elements, to my knowledge, can be heated to a high enough temperature that certain gases that are non-reactive with the element can be heated above 2000 degrees Farenheit. That is what I meant by technically feasible.

Q. And if those gases are directly applied at that temperature to the well bore they would still be at that temperature and perform the function that is described in Justheim? A. I think I can conceive of that as being technically feasible.

Q. Did Justheim describe it? A. Well I read a paragraph here in that earlier application that it seemed to me that he did describe
70 such a thing. He was using gases with that heat exchanger. I think it was the third paragraph of page 11 that I saw this morning.

Q. Let me show you that exhibit, plaintiff's exhibit 1, which is the certified copy of the first Justheim application, and let's look at that paragraph again. A. In this paragraph here he says: "It is to be understood, however, that in some instances it may be desirable to pass inert gases, * * * in heat exchange relationship with the reactor and thence underground as a heating medium." I take that to mean that he is contemplating putting gases that are not reactive with carbon and unclad elements and passing gases over those elements and putting it directly in contact with the shale.

Q. I will ask you again. At the time this application was filed in 1955, was there available such a reactor? A. In my knowledge, there was; and I think that if you can get that information from the A.E.C. if they will give it to you that there was too.

Q. Speaking of what your knowledge is, was that an experimental reactor? A. Yes, sir.

Q. It was not a reactor which was actually in use, it was just for experimentation? A. Yes, sir.

71 MR. SCHIMMEL: I think that is all I have, Your Honor.

THE COURT: Have you any redirect?

MR. MALLINCKRODT: Yes, Your Honor.

REDIRECT EXAMINATION

BY MR. MALLINCKRODT:

Q. Mr. Huntington, if you had this 1955 disclosure of Justheim before you, which is exhibit 1, and from the drawing of that the box marked "nuclear reactor" and you were contemplating applying the method that is disclosed in this patent application to a deposit oil shale, where would you go to get a reactor? Who would you have to go to get the reactor? A. The fuel has got to come from the A.E.C.

Q. Would you have to get the permission of the A.E.C.? Would the A.E.C. have to know that you were going to use a reactor and would you have to get a license? A. Yes, sir. You would have to submit a hazard report first and go through the usual process of getting permission.

Q. Then in order to get a reactor for use in that process, would you have to depend upon the technical know-how of the A.E.C.? A. To a large degree.

72 Q. Now you have previously indicated that you know that in 1955 there was an atomic reactor utilizing unclad fuel elements which could be used in this process in accordance with the third paragraph on page 11 of this application? A. Yes, sir.

Q. Would you expect then that if you wanted to apply the Justheim process that the A.E.C. could supply you with a reactor for the purpose? A. I believe that with the knowledge they had then you could engineer and build a reactor that would heat gas sufficient to do what is claimed here; yes, sir.

Q. Was there a reactor designed that the A.E.C. could follow and provide you with the reactor for doing this job? A. To attain the temperatures of coolant in excess of 2000 degrees Farenheit they could; yes, sir.

Q. And you could achieve a temperature in the bore hole of 2000 degrees Farenheit with such a reactor? A. Well now, the coolant could be led away from the fuel elements above 2000 degrees Farenheit. Now how far you want to go with it, etc., you say bore hole, it could be introduced to shale, I would say, yes. You see, the thing is technically feasible with the information that existed at that time. That is my opinion.

Q. Yes, that is right. Would this disclosure of the Justheim
73 patent application enable you to use such a reactor for the purpose of applying 2000 degree temperature heat to the shale? A. It is my opinion, that if I had the facilities of the A.E.C. at that time that such an experiment could be run; yes, sir.

Q. Now I refer you to figure 4 of the continuation-in-part application, plaintiff's exhibit number 2, and ask you whether that discloses an operable reactor underground? A. Well, if you have the right atomic ratio of uranium and moderator you can certainly get some heat out of it.

Q. Would that be engineering knowledge that would be routinely applied by nuclear engineers? A. Yes.

Q. It would be strictly design data such as you would require if you were going to use a pump, for example, to do a job? A. Yes. There is nothing particularly novel about getting a critical array of uranium and carbon. That was ten years old at this time, if I remember correctly.

Q. Now you have equated the term "technically feasible" with
the thought of possibility of accomplishment rather than with econom-
ics. You have already indicated that what is disclosed by Mr. Just-
heim is technically feasible. Is it possible that as the nuclear art
74 progresses that it also can become economically feasible? A. It is
possible.

Q. In other words, is economics dependent on factors that are different from technical feasibility? A. Yes, sir.

Q. And is it true that something that is technically feasible today often becomes economically feasible tomorrow, so to speak? A. The possibilities are good that technical feasibility will lead eventually to operability; yes.

Q. I hand you a copy of a patent number 3,085,957 identified as plaintiff's exhibit 18 and ask you to state to whom that patent was assigned? A. Richfield Oil Corporation.

Q. Will you briefly look over the patent and tell me whether that deals with the recovery of products from oil shale by in situ treatment? A. This refers to the secondary recovery of petroleum, evidently.

Q. Is that analogous in one sense to the treatment of oil shale? A. It is analogous in a sense.

Q. In other words, it is underground, and it is applying heat
75 underground to a carbonaceous material? A. Not necessarily car-
bonaceous.

Q. But the material must be heated to obtain products? A. That is right. Hydrocarbonaceous, I guess you might say.

Q. Does this utilize a nuclear reactor? A. Yes, sir.

Q. Will you read what that says about temperature with respect to a nuclear reactor? A. This filing date was December 26, 1957, and it issued on April 16, 1963. " . . . temperature within the bore hole. This temperature will usually be in the range of about 300 degrees F. to 2000 degrees F., and preferably from about 400 degrees F. to 1500 degrees F." He claims 2000 degrees Farenheit in the bore hole.

Q. Now the fact that Richfield Oil Corporation was sufficiently interested to bother about a patent utilizing a nuclear reactor underground with a temperature of 2000 degrees Farenheit, would that indicate to you that there was some practical significance to this whole thing that Mr. Justheim has been talking about in his patent application? A. Somebody else evidently thinks it is feasible too.

MR. MALLINCKRODT: I offer plaintiff's exhibit 18 in evidence.

76 MR. SCHIMMEL: No objection.

THE COURT: Without objection it may be marked in evidence.

THE DEPUTY CLERK: Plaintiff's Exhibit Number 18 is marked in evidence.

(Plaintiff's Exhibit No. 18 was received in evidence.)

MR. MALLINCKRODT: That is all, Your Honor.

THE COURT: Have you any recross?

MR. SCHIMMEL: Yes, sir, I have a question in connection with plaintiff's exhibit 18. But prior to that, may I, Your Honor, correct my omission?

THE COURT: You may.

MR. SCHIMMEL: I believe this patent to Mr. Justheim and Mr. Huntington that I questioned the witness about should be introduced into evidence as our exhibit 2.

MR. MALLINCKRODT: No objection.

THE COURT: It may be marked in evidence as such.

THE DEPUTY CLERK: Defendant's Exhibit 2 is marked in evidence.

(Defendant's Exhibit No. 2 was received in evidence.)

RECROSS EXAMINATION

BY MR. SCHIMMEL:

77 Q. Mr. Huntington, in connection with plaintiff's exhibit 18, is the temperature that you referred to the temperature of the nuclear fuel in the reactor? A. I am sorry. Which is 18?

Q. The new patent that was just introduced in evidence. A. Oh. In line 66, " . . . within the thus positioned nuclear reactor, the control providing a means to regulate the rate of fission and ultimately the temperature within the bore hole. This temperature will usually be in the range of about 300 degrees Farenheit to 2000 degrees Farenheit . . ." I assume he means within the bore hole.

Q. May I call your attention to the fact that he is using a coolant also, is he not? A moderator coolant?

Looking at column 2 beginning at line 64. The last paragraph in column 2 beginning at line 64. A. He has a heavy water moderator.

Q. He shows a preference for a heavy water moderator, does he not? A. Yes, he does.

Q. And calling your attention to column 6, line 54, would you mind reading that sentence into the record, beginning with "For"? A. (Reading) "For instance, about 700 degrees Farenheit is the maximum temperature attainable using heavy water as the moderating medium." 78

Q. In a heavy water moderated coolant reactor the maximum temperature is 700 degrees Farenheit, isn't it? A. I should think that would be true.

MR. SCHIMMEL: Thank you.

THE COURT: Are you through with the witness?

MR. SCHIMMEL: Yes, sir, I am.

THE COURT: How about you, Mr. Mallinckrodt?

MR. MALLINCKRODT: May I have a moment, Your Honor?

THE COURT: All right.

REDIRECT EXAMINATION

BY MR. MALLINCKRODT:

Q. In plaintiff's exhibit 18 I see that it was filed in 1957. While the particular nuclear reactor which they show in that patent application is spoken of as a heavy water cooled reactor, would the fact that 2000 degrees Farenheit is mentioned as a possible bore hole temperature indicate to you that it was regarded as a feasible thing at that time? A. Not in this heavy water moderator; no, sir.

Q. I mean with some nuclear reactor that might possibly be used? A. Only for gas cooled. That is the only way you could imagine the temperature that high.

79 Q. But the temperature is used in this patent specification, is it not, and there would seem to be a reason for noting the 2000 degrees Farenheit as being a possibility? A. Well, I can't answer it any way except it is impossible if you are going to use water as a moderator.

Q. On the basis of your prior testimony, would you assume that the disclosure of this patent was based on the knowledge that a 2000 degree Farenheit temperature could be obtained in some reactor that might be used if it were decided that they wanted to have that 2000 degree temperature? A. Unclad fuel elements swept with a non-reacting gas can give you a gas that is above 2000 degrees Farenheit. That I know.

Q. And can be used in a bore hole? A. It could be used in a bore hole.

Q. To place heat of 2000 degrees Farenheit in the bore hole? A. It is technically feasible.

MR. MALLINCKRODT: That is all.

MR. SCHIMMEL: I have no further questions.

THE COURT: Are you through, counsel?

MR. MALLINCKRODT: I am through, Your Honor.

THE COURT: Very well, Mr. Huntington, you have had a long siege of it.

[Filed Feb. 10, 1965]

NOTICE OF APPEAL

Notice is hereby given this 10th day of February, 1965, that Clarence I. Justheim, plaintiff, hereby appeals to the United States Court of Appeals for the District of Columbia from the judgment of this Court entered on the 16th day of December, 1964, in favor of defendant against said plaintiff.

Shlesinger, Shlesinger & Arkwright
/s/ George A. Arkwright

BRIEF FOR APPELLEE

United States Court of Appeals
FOR THE DISTRICT OF COLUMBIA CIRCUIT

Appeal No. 19,243

CLARENCE I. JUSTHEIM, APPELLANT

v.

DAVID L. LADD, COMMISSIONER OF PATENTS, APPELLEE

Appeal From the Judgment of the United States District Court for the District of Columbia

United States Court of Appeals
for the District of Columbia Circuit

FILED JUL 7 1965

Nathan J. Paulson
CLERK

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Appeal No. 19,243

STATEMENT OF QUESTIONS PRESENTED

In the opinion of Appellee, the questions presented are:

1. Whether the requirements of the first paragraph of 35 USC 112 for a written description of the invention and of the manner and process of making and using it in such full, clear, concise and exact terms, and the "best mode" contemplated by the inventor of carrying out his invention, are satisfied where the application did not disclose, or describe expressly any particular type of nuclear reactor, where the use of such reactor is "a highly significant part" of the invention?

2. Whether where the requirements of the first paragraph of 35 USC 112 are admittedly not expressly met, those requirements may be waived or be considered legally met because a single person skilled in the art has personal information or knowledge of a nuclear reactor which may be able to be used to carry out the invention?

3. Whether the findings of the District Court that the claimed invention would be obvious to workers skilled in the art, in view of the prior art cited, was so clearly erroneous as to justify reversal of concurring decisions of the Patent Office tribunals and the District Court on this factual question?

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United States Court of Appeals
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Appeal No. 19,243

CLARENCE I. JUSTHEIM, APPELLANT

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DAVID L. LADD, COMMISSIONER OF PATENTS, APPELLEE

Appeal From the Judgment of the United States District Court for the District of Columbia

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BRIEF FOR APPELLEE

This is an appeal (J.A.-55) from the order of the United States District Court for the District of Columbia, filed December 16, 1964 (J.A.-4), dismissing a complaint for the issuance of a patent (J.A.-2), against the Commissioner of Patents, defendant-appellee, brought under the provisions of Title 35 United States Code, Section 145, in which plaintiff-appellant sought a decree ordering the Commissioner of Patents to issue to plaintiff letters patent of the United States based upon and containing a single claim of plaintiff's patent application, Serial No. 782,552, filed January 5, 1959, entitled "Distillation of Underground Deposits of Solid Carbonaceous Materials In Situ." The claim at issue is claim 23 of said application, which is reproduced in the opinion of the District Court (J.A.-5).

The complaint was dismissed by the court after trial, at which plaintiff-appellant introduced expert testimony and numerous documentary and physical exhibits in the attempt to show that the tribunals of the Patent Office had erred in concluding that a patent could not lawfully be granted based on the involved application. After taking the matter under advisement, the trial court rendered an opinion (J.A.-4-8), incorporating therein findings of fact and conclusions of law, wherein defendant-appellee's denial of a patent based on the involved application was sustained.

COUNTER STATEMENT OF THE CASE

Appellant's statement of the case needs clarification and amplification. Though it is true that the involved application is a continuation-in-part application of an original application, identified as Serial No. 537-123, filed on September 28, 1955, identically entitled, (Br-3), appellant fails to add that the original application was finally rejected by the examiner on the ground that the disclosure was defective because of the failure to show or describe the structure and controls for a nuclear reactor to produce the desired result (SJA-131), and that only then did appellant abandon the original application by transferring the drawing thereof to the later filed presently involved application (SJA-142).

The original application states that the principal purpose of the invention is to provide a method for distilling deposits of oil shale and other solid carbonaceous materials in situ, by establishing an exceptionally high temperature within the deposit, which is accomplished as a practical matter by utilizing a nuclear reactor adjacent the area to apply a constant source of high temperature heat exchange medium which is circulated through heat exchangers within the deposit to be worked (SJA-107, 108). The concept of supplying heat from a nuclear reactor is said to represent a "a highly significant part" of the invention. (SJA-115). Any known type of nuclear reactor capable of furnishing the energy requirements is said to be employable (SJA-115), and the application drawing depicting the apparatus for performing the method (SJA-122) does not illustrate any particular nuclear reactor.

Though the presently involved application includes the description and drawing of the original application, and also emphasizes that the "aim of the present invention is to utilize nuclear energy to advantage underground" (SJA-2); that the concept of applying heat from nuclear reaction to an underground area represent "a highly significant part of the present invention"; and that "any type of nuclear reactor capable of furnishing the energy requirement" may be employed (SJA-10), there is added to the description an identification of "a satisfactory type of nuclear reactor for the purpose" as the one disclosed in a

Huntington application, Serial No. 776,465, filed on November 26, 1958. (SJA-11), and an additional schematic illustration in Fig. 4 of a plant showing a nuclear reactor within the shale deposit (SJA-23).

Appellant's statement of the case with respect to the issue of insufficient or defective disclosure (Br-2, 3), would appear to limit this issue to the original application filed in 1955. However, as is apparent from a mere reading of the decision of the Patent Office Board of Appeals (SJA-74) which was under review in the District Court, the presently involved application, the application filed in 1959 as a continuation-in-part application, was also considered to be legally defective because the apparatus disclosed and illustrated was inoperative and unsuitable for the principal feature of appellant's claimed process. (cf. S.J.A.-64-66 and 74, 75). The opinion of the District Court clearly recognizes this issue (JA-5). Accordingly, it is submitted that the question of insufficiency of disclosure, and hence, failure to comply with the requirements of 35 USC 112, as to the presently involved application is also at issue in this appeal, along with all the other issues recognized by appellant's statement of the case.

THE PRIOR ART

Lungstrom Patent No. 2,732,195, granted January 24, 1956, on an application filed June 24, 1947 (In Sweden on December 4, 1941) discloses a method of recovering oil from shale, by supplying heat through channels bored into the shale, by means of an electric heater, the product distilled therefrom being recovered through other channels spaced from the channels carrying the heaters. Temperatures lying between 500° and 1000°C are said to be attained (SJA-86, col. 4, lines 17-21).

French Patent No. 1,147,517, delivré June 11, 1957, describes a method of working subterranean deposits of coal, lignite or other bituminous products or oil shale by placing a charge of atomic fissionable material in the deposit, the heat of atomic fission being sufficient to bring about distillation of volatiles. Temperatures up to about 1200°C are said to be required for distilling, carbonizing or coking the bituminous materials, and the desired temperature is obtained by suitable control of the fission reaction [SJA-146, lines 43-72, of British Patent No. 823,777, which by agreement between the parties was to be treated as a translation of this French Patent (JA-11)].

SUMMARY OF ARGUMENT

1. Section 112 of Title 35 USC sets forth certain requirements for the written description of the invention for which a patent is sought. That section embodies the requirement of the prior law (R. S. 4888) that the invention and the manner and process of making and using it shall be set forth in such full clear, concise and exact terms as to enable any person skilled in the art to which it pertains to make and use the same. Further the present section requires that the description shall set forth the best mode contemplated by the inventor of carrying out his invention.

Admittedly the specification of the original application did not disclose or describe expressly a particular nuclear reactor suitable for carrying out the process claimed. Hence, the statutory mandate for a description of the inventor's "best mode" of carrying out his invention was not compiled with. Since the question of the sufficiency or insufficiency of a particular specification description to meet the statutory requirements is a matter of law—Petrocarbon Ltd. v. Watson, 101 U. S. App. D. C. 214, 246 F.2d 800; Watson v. Bersworth, 103 U.S. App. D. C. 187, 251 F.2d 898—appellant's reliance upon the opinion of Mr. Huntington that the disclosed process is theoretically possible and technically feasible (JA-34) is misplaced, first because that opinion is based upon personal information of experimentation with unclad fuel elements—apparently restricted and classified information (J.A.-45)—and second, because the witness' knowledge fails completely to meet the statutory mandate requiring the applicant-inventor to set forth the best mode he found for carrying out the invention.

Futhermore, the examiner had finally rejected the claims of the original application as based upon a defective disclosure—namely, one which did not meet the requirements of 35 USC 112 and appellant had accepted that decision by filing the involved application containing additional disclosure. Since appellant could have challenged that decision in the original case, but, instead, chose to abandon his right to review, the holding that the original application was fatally defective takes on the aspect of res judicata. Overland Motor Co. v. Packard Motor Car Co. et al, 274 U.S.

417; Philip A. Hunt Co. v. Mallinkrodt Chemical Works (CA-2) 177 F.2d 583.

2. The application directly involved refers to the nuclear reactor disclosed in Huntington application Serial No. 776,465 as a satisfactory type to accomplish appellant's purpose. Apparently that specific statement exemplifies appellant's idea of the "best mode" requirement of the statute. Canadian Patent No. 658,889 (Ptf's Exh. 5) corresponds to that application and is an exact duplicate of the United States application (JA-41). Testimony of Mr. Huntington was clear that the reactor shown in the Canadian patent if used as the reactor in appellant's Fig. 1 could not produce a temperature of at least 2000°F at the bottom of the hole drilled in the shale deposit (JA-44), and could not be used underground in the form schematically illustrated in appellant's Fig. 4 (JA-45). The specific reactor appellant describes as suitable is, according to this testimony inoperative for the intended purpose. Clearly the statutory requirement is not satisfied by a disclosure which is incapable of producing the necessary conditions for carrying out appellant's invention.

3. The prior art as evidenced by the Ljungstrom patent shows that it was known prior to appellant's entry in the field to heat shale in situ to temperatures between 500° and 1000°C to distill the volatile constituents thereof. The 1000°C temperatures corresponds to 1832°F. Testimony showed that the effect of heat on the shale deposit is to cause fissuring permitting the volatile products to escape and that it was known and expected that an increase in temperature

would produce increased fissuring up to the fusion point of the shale. Hence, to increase the temperature from 1832°F to 2000°F as appellant teaches would be obvious to the skilled worker.

4. French Patent No. 1,147,517 describes the concept of heating oil bearing material, to 1200°C to distill out the volatiles the high temperatures being obtained by means of a nuclear reactor. The application of that concept to oil shale would be obvious to a skilled worker, and hence unpatentable.

THE ARGUMENT

1.—Insufficient Disclosure

Section 112 of Title 35 USC requires that every applicant for patent present a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise and exact terms as to enable any person skilled in the art to make and use the same, and that the best mode contemplated by the inventor of carrying out the invention shall be set forth. The first issue in this case revolves around this requirement.

Appellant contends (Br-7) that the original application filed in 1955 is sufficient to meet the requirements of 35 USC 112. It should be noted that appellant's brief does not contest or challenge the finding of the District Court and of the Patent Office tribunals that the later application itself filed in 1959, the application to which the complaint (JA-2, 3) is directed, fails also to meet the statutory requirement. Under these circumstances, it could be urged that the appeal should be dismissed forthwith. However, this brief will discuss fully the issue of defective disclosure, as it concerns both applications.

Since plaintiff contends (Br.-7) that the parent application contains a disclosure which complies with the requirements of 35 USC 112, it is important to analyze the disclosure of the involved application in all its facets and details. In doing so it will be assumed that the statement in the latter application that a satisfactory type of nuclear reactor for the purpose is that shown and described in Huntington application Serial No. 776,465 of November 26, 1958 (SJA-11) exemplifies the "best mode" requirement of the statute. Appellant's brief is totally silent on this question.

The first embodiment of a plant for carrying out the process is shown in Fig. 1 (SJA-21), in which the nuclear reactor is shown above the surface, and heat generated in the fission reaction is imparted to a primary heat transfer medium, such as molten sodium, which is itself circulated through a heat exchanger within the shale (SJA-6) or the heat of the primary heat transfer medium is imparted to a secondary heat transfer medium, such as water, air or superheated steam, which is circulated to the bed of shale (SJA-7). This embodiment was disclosed in essentially the same way in appellant's original application. The examiner held (SJA-64), and the Board of Appeals concurred in that holding (SJA-75), that neither when that application was filed in 1955, nor when the presently involved application was filed in 1959, was there available a reactor which could heat (and continue to heat) a heat exchange medium to the temperature of 2000°F, which is required by the terms of the claim. Further, as pointed out by the examiner (SJA-65) nuclear reactors operate at temperatures lower than 2000°F, and though the nuclear fuel is at a relatively high temperature the coolant is at a much lower temperature than the 2000°F required for appellant's purpose.

The evidence adduced at trial fully and adequately supports the examiner's position. Appellant's expert, Mr. Huntington, testified that the coolant in the device of Wollan Patent No. 2,990,348 referred to in the trial court's opinion (JA-6) could not possibly have a temperature of 2000°F, (JA-47) and also that the coolant used in the device of Thomson et al., patent No. 2,992,981, also referred to in the opinion (JA-6) was at a much lower temperature than 2000°F, even though the temperature of the nuclear fuel was 2500°F (JA-47). Each of the nuclear devices shown by these prior art patents operated with coolants in heat exchange relation with the nuclear fuel, in exactly the same manner as that of the plant shown in appellant's illustrative Fig. 1 (JA-21).

Further, the evidence showed that a patent (3,028,330) granted to Mr. Huntington and another as joint inventors on an application filed on April 7, 1959 contains the statement that "no presently known system of nuclear fuel containment is adequate for operation at temperatures of high incandescence, i.e., above 3000 degrees F." Manifestly this statement corroborates the examiner's statement (SJA-65) that there are limits to the temperature at which a reactor can operate, the ordinary limits being the melting point of the materials of the fuel and of the reactor. Hence, at the time appellant filed his applications, in 1955 and 1959, there was no available reactor of the heat exchange type which could operate to produce a temperature of 2000°F at the desired situ, namely the bottom of the hole bored in the shale deposit. The testimony showed that Mr. Huntington believed the statements made in his patent were true (JA-46) at the time made.

Significant and conclusive on this issue is Mr. Huntington's testimony relating to the allegation in the specification (SJA-11) that a satisfactory type of nuclear reactor for the purpose was that disclosed in the Huntington application, Serial No. 776,465, filed November 26, 1958. The evidence shows that a corresponding application was filed in Canada, and a patent was granted thereon — Canadian patent 658,889. The Canadian and United States applications were testified to as being identical (JA-41). A water coolant was used in that reactor, which was converted into steam, and the maximum temperature of the super heated steam would be about 1000°F. (JA-42). Mr. Huntington testified that if his reactor were used as the nuclear reactor shown diagrammatically in Fig. 1 of the involved application (SJA-21) it would not be possible to obtain a temperature of 2000°F at the bottom of the drill hole (JA-44). Further, Mr. Huntington testified that even if molten sodium (as suggested in appellant's application) were to be used as the coolant in his reactor, the maximum temperature attainable would be

1400°F (JA-44), much less than the 2000°F disclosed as necessary to obtain the intended result. In view of this evidence it is clear that so far as the Fig. 1 embodiment of a purported suitable plant is concerned, the disclosure of the later filed application is inoperative, for the intended purpose. Hence, that description fails to meet the requirements of 35 USC 112.

Inasmuch as the description of appellant's original application was limited to the embodiment shown in Fig. 1, it is manifest that the disclosure of that application, likewise, was insufficient under the law. Since the right to claim the benefit of the filing date of an earlier application depends solely upon meeting the conditions set forth in 35 USC 120, and since an important condition therein is that the invention be disclosed in the manner provided in section 112, it is clear that appellant's date of invention for the subject matter of the claim at issue does not and cannot relate back to the filing date of the original application. Moreover, since the original application was finally rejected for insufficient disclosure, and appellant chose to abandon that application in favor of the continuation application containing additional disclosure that issue would seem to be res judicata. Overland v. Packard, 274 U. S. 417.

Appellant's second embodiment of a plant for carrying out the process—disclosed first in the application directly involved in this proceeding is that shown in Fig. 4 (SJA-23). In this embodiment the nuclear reactor is placed within or at the bottom of the bore hole. In the examiner's opinion there is no full example of the fuel composition and its relative amount in the fuel-graphite mixture, the mere reference to certain applications of appellant (which are abandoned) being considered inadequate and insufficient. Further, the examiner indicated that since the specification states that that reactor may be operated at incandescent temperatures up to about 6000°F (SJA-12), control rods capable of controlling the reactor at that temperature should have been disclosed. (SJA-66). In the opinion of the Board of Appeals, if a particular instrumentality is required for carrying out the process, there should be no doubt as to the essential features thereof, and where, as here, the use of this particular device provides the basis for patentability and appellant points to no published description of any device which could be used for the desired purpose, the description is insufficient under the law. (SJA-75). See In re Chilowsky, 50 CCPA 806, 306 F.2d 908.

As pointed out previously, testimony of Huntington with relation to his own Patent No. 3,028,330, is clear that no known system of nuclear fuel containment is adequate for operation at temperatures in excess of 3000°F. The application which mature~~s~~d into Patent No. 3,028,330 was filed subsequent to the filing date of the application at bar. Hence, at the time appellant's later filed application was presented, the art did not know how to obtain a temperature of 6000°F with known nuclear reactors. Appellant's reference to such temperatures is manifestly pure conjecture and speculation.

Further, with reference to the intimation in appellant's application that the nuclear reactor shown and described in the identified Huntington application is a satisfactory type of reactor for the purpose, the testimony of Mr. Huntington is clear that his reactor could not be used in the plant illustrated in Fig. 4 (JA-45). Further, it is definite from this witness' testimony that the information relating to reactors operable at temperatures in excess of 2000°F was classified and personal, not publicly known (JA-45). Hence, even with respect to the embodiment illustrated in Fig. 4, in which the reactor is underground, the specification is wholly speculative. Manifestly, such speculative disclosure does not comply with 35 USC 112.

Accordingly, it is submitted that considering the totality of the evidence presented, there was no error in the findings of the Patent Office tribunals that the specification of each of appellant's applications, Serial No. 547, 123, filed September 28, 1955, and Serial No. 785,552, January 5, 1959, was inadequate and insufficient under the law (35 USC 112), and that there was no error in rejecting the claim at issue for that reason.

Appellant's brief discussion on this issue (Br-7,8) relies solely upon Mr. Huntington's statement of the existence of knowledge, under the control of the Atomic Energy Commission, of a reactor which could be used in connection with appellant's invention. For reasons set forth above, private knowledge of another does not meet the mandate of the statute that the applicant-inventor set forth in the description the best mode he devised for carrying out the invention. Reliance upon Mr. Huntington's knowledge is a tacit admission that the specification is fatally defective. Hence, this fact alone would suffice to affirm the decision of the District Court on this issue.

2—Unpatentability Over Ljungstrom

The prior art, as evidenced by the patent to Ljungstrom (SJA-80) shows it to be old to heat shale in situ by heating elements placed in channels bored therein, the temperature attained being between 500 and 1000°C. The products produced under the action of the heat are recovered through other channels bored in the shale. Essentially the sole difference between the reference disclosure and the claim is the limitation to "at least 2000°F.". This limitation was considered non-critical by the Patent Office tribunals (SJA-66). Increasing the temperature from 1000°C (1832°F), as disclosed in the reference to 2000°F, as claimed, was deemed within the skill of the art, since no new or unobvious result appears to be obtained by that slight increase in temperature.

Appellant introduced evidence at trial in the attempt to show criticality in this limitation. The testimony of Dr. Schairer pointed out that when shale is heated at 1000°C (1832°F) some fissuring takes place, that at a temperature of 2048°F considerable fissuring occurs, and that at 2102°F fusion takes place (JA-18), from which he concluded that there is "a remarkable difference" between the lower temperatures and the 2000°F one. On the other hand Dr. Bonney testified that it would be expected that as the temperature to which the shale is subjected is increased, an increased fissuring effect would be obtained (JA-26); and that given Ljungstrom's, teaching, an increased fissuring would be expected if ~~it~~ the temperature was raised above the maximum (1000° C) he discloses. (JA-26).

Under these circumstances, it is submitted that there was no error in the findings of the examiner and Board of Appeals that the 2000°F limitation in the claim at issue lacked criticality. Criticality imparts some different physical phenomena, not a mere progressive change. Helene Curtis v. Sales Affiliates (CA-2) 233 F.2d 148. The use of a temperature slightly above that disclosed by the references is merely a matter of choice within the skill of the worker in the art, accomplishes only the same result, namely the distillation of the oil from the shale.

Further with respect to the limitation in the claim of the use of a nuclear reactor to obtain the necessary heat, it suffices to point out that nuclear devices are known heat sources and the broad concept of substituting one source of heat for another is within the skill of the art. Apart from the fact that the necessary temperatures are unobtainable from reactors known at the time the involved application was filed, appellant's designation of such a heat source, it is submitted, is without patentable significance.

3—Unpatentability Over French Patent No. 1,147,517

A third ground of rejection raised by the examiner and approved by the Board of Appeals is based upon a combination of the disclosure of French Patent No.

1,147,517 (SJA-90) and the Ljungstrom Patent (SJA-80). As indicated by the examiner, the French patent shows the heating of oil bearing material to 1200°C to distill out the oil, and suggests the use of a nuclear reactor to obtain the necessary temperature. Hence, the broad concept set forth in the claim at issue is found in the French patent, as applied to oil bearing materials in general, and it was the opinion of the Office tribunals that the application of that concept to oil bearing shale would not be patentable, particularly since heating oil shale to high temperature (1000°C) was old in Ljungstrom. It should be noted that British Patent No. 823,777, by agreement, considered to be a translation of the French patent, expressly mentions oil shale. (SJA-146).

The application of an old process to a closely analogous material is obvious and therefore not patentable. Paramount Publix Corp. v. Amer. Tri-ergon Corp. 29 U.S. 464, In re Patton et al. 43 CCPA 974, 234 F.2d 499. Manifestly oil bearing shale is closely analogous to the oil bearing materials described in the French patent, and the applicability of that process to oil shale would be obvious to workers in the art, even in the absence of the disclosure of the Ljungstrom patent. But given the teachings of both patents the advisability of utilizing the French process with oil shale would be clearly apparent and obvious. Hence, in view of 35 USC 103, the claim is unpatentable.

Though the effective date of the French patent is subsequent to the filing date of appellant's original application, that patent is a proper reference for the claim at issue, because appellant is not entitled to the benefit of the filing date of that application, for reasons fully set forth hereinabove. The disclosure of an original application found to be inadequate under 35 USC 112 can form no basis for a claim of priority. The disclosure of the involved application, filed in 1959, also constitutes no more than a bare concept since no operable device for carrying out the process is disclosed, or even known at that time. Since that bare concept is described in the French patent, it (the patent) is a proper reference.

CONCLUSION

It is respectfully submitted that the District Court's findings and conclusions find adequate and reasonable basis in the record; that the applications upon which the claim for letters patent are based are fatally defective in that the descriptions do not meet the requirements of 35 USC 112; and that the decision appealed from should be affirmed.

Respectfully submitted,

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